JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

OCTOBER, 1835.

Essays on Calcareous Cements. *By* James Frost, *Esq., Civil Engineer, New York.*

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

Sir:

Having many years since, in my native country, [England,] formed various calcareous cements, of a beautiful colour, by a new process, which cements appeared to be very hard, and to become more so, I was desirous of comparing them with other hard substances, and of obtaining, if possible, their relative value, without injuring the specimens. This object was satisfactorily attained by abrading them, by means of fine emery and water, against a standard piece of white statuary marble, and calculating their relative hardness from the weight lost by each substance in the operation.

It soon became evident that the term strength would better define the result than the term hardness, which being an abstract quality, always in combination with another abstract quality, tenacity, jointly constitute strength, by which all change of form is resisted. Statuary marble was used as the test for all substances, from brass to work stone, inclusive, which latter substance was used to test the weaker articles, while the stronger were tested in succession with each other.

As another attempt to obtain similar information was recorded in the Annals of Philosophy, by Mr. Bevan, in the numbers for March

and April, 1831, and as that gentleman operated on some of the same substances by percussion, and obtained thereby somewhat different results, a careful consideration of the two modes employed seems to indicate that percussion is rather a measure of tenacity, and abrasion a measure of hardness.

In measuring the minute differences of hardness in substances nearly similar, abrasion is evidently the only means of obtaining satisfactory results.

I shall defer the details relative to the strength of calcareous cements, which it is my intention hereafter to furnish, only stating, that I possess a collection ranging from 1 to 580; but I shall, in due course, enter fully on these curious and important distinctive properties. I shall thus place at your disposal the results of a long course of experiments, made on a large scale, with a view to improve the theory, formation, and useful application, of these interesting substances.

As there are few scientific subjects respecting which there are so many conflicting theories, and, amongst practical men, so many different opinions, you may perhaps consider an attempt at elucidation and improvement worthy the attention of your numerous scientific and practical readers.

Comparative Strength with which various Substances resist Abrasion.

Hard cast-steel,	6014
——————— yellow tempered,	3184
——————— blue tempered,	1592
Soft gray cast-iron,	1293
Black flint,	1939
Rock crystal,	1600
Aberdeen granite,	980
Broner stoneware,	950
Yellow brass,	675
Wedgewood's evaporating basin,	600
Copper keg,	525
Hard Yorkshire paving stone,	327
Old blue Purbeck "	318
Italian black marble,	260
Forest marble,	200
Common unglazed earthenware,	193
Sienna marble,	177
Kilkenny black marble,	110
Statuary marble,	100
Old Portland stone,	79
Roman cement stone,	69
Roman cement, (12 months old,)	58
Fine grained Newcastle grindstone,	53
Welsh blue roofing slate,	41
Fluor spar,	39
Stock brick,	34

Calcareous spar, (Iceland,)	33
Wirth sand-stone, (Sussex,)	17
Coarse grained Newcastle grindstone,	14
Bath stone, (Oolite,)	12
Chalk at Barton on Humber, (Cawk,)	15
" at Dover, (fossil bed,)	6
Gypsum, uncabined,	5
Plaster of Paris, (3 months old,)	.40
Thames chalk,	.18

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Alloys, Solders, and Amalgams, used in the Arts.

TO THE COMMITTEE ON PUBLICATIONS.

GENTLEMEN,—The following table of the alloys and amalgams used in the arts, has been prepared by Mr. Chaudet, a distinguished and experienced assayer in the mint of Paris, from actual analysis of carefully selected samples. In a few instances, the proportions of the composing metals are not given, for reasons that, in one instance at least, are obvious. This deficiency is more than compensated by the addition of several others, particularly that of the alloys of Palladium, which I have added, in the full persuasion that the whole will be found useful. Yours, &c.

FRANKLIN PEALE.

Table of Alloys, Solders, and Amalgams, used in the Arts.

Alloy of Gold Coin.—(French Standard.)		
Gold,	900	1000
Copper,	100	
Alloy of Silver Coin.—(French Standard.)		
Silver,	900	1000
Copper,	100	
Alloy of "Billon."—(French Standard.)		
Copper,	800	1000
Silver,	200	
Alloy of Gold Medals.—(French Standard.)		
Gold,	916	1000
Copper,	84	
Alloy of Bronze Medals.*		
Copper,	92	100
Tin,	8	
Alloy of Jewellery.—(French Standard.)		
Gold,	750	1000
Copper,	250	
Alloy of Silver Plate.†—(French Standard.)		
Silver,	950	1000
Copper,	50	

* The medals made from this alloy are cast; they have the advantage of being struck by a few blows of the press, and of wearing a long time.

† The standard here indicated is the best; a second is composed of 800 of silver, and 200 of copper, in the 1000.

Alloy of Gold Coin.—(United States' Standard.)

Gold,	899.22	1000
Copper and Silver,	100.78	

Alloy of Silver Coin.—(United States' Standard.)

Silver,	892.43	1000
Copper,	107.57	

Alloy of Gold Coin.—(English Standard.)

Gold,	916.67	1000
Copper and Silver,	83.33	

Alloy of Silver Coin.—(English Standard.)

Silver,	925	1000
Copper,	75	

Alloy in imitation of Gold.

Copper,	91.00	$100\frac{1}{2}$
Tin,	9.50	

Alloy in imitation of Silver.*

Copper,	61.27	106
Zinc,	28.78	
Nickel,	15.13	
Lead,	.82	

Alloy for Cannon.†

Copper,	100	111
Tin,	11	

Alloy for Statues.‡

Copper,	91.40	100
Zinc,	5.53	
Tin,	1.70	
Lead,	1.37	

Alloy for Bronzes and Candelabras.

Copper,	82.00	$104\frac{1}{2}$
Zinc,	18.00	
Tin,	3.00	
Lead,	1.50	

Alloy for the Mounting of Fire-arms.

Copper,	80	100
Zinc,	17	
Tin,	3	

Alloy for Cymbals,§ Tam Tams, or Chinese Gongs.

Copper,	80	100
Tin,	20	

* This alloy is the Packfond of the Chinese.

† In this alloy, small quantities of lead and zinc are often found, but they are present by accident.

‡ The proportions here indicated are the result of an analysis of the beautiful bronze statues of the garden of Versailles, which were cast by the Brothers Kellers, celebrated founders employed by Louis XIV.

§ This alloy is very hard; it is annealed by dipping, while red hot, into water, and is then malleable; whilst, if suffered to cool gradually, it is excessively hard; this important fact is due to M. d'Arcet, who has thus furnished the means of fabricating, in France, cymbals, &c., formerly imported, at great cost, from China.

Alloy for Bells.

Copper,	75	100
Tin,	25	

Alloy for the Reflectors of Telescopes.

Copper,	2	3
Tin,	1	

Alloy for Brass for the Lathe.*

Copper,	65.80	100
Zinc,	31.80	
Lead,	2.15	
Tin,	0.25	

Alloy of Brass for the Hammer.†

Copper,	70.10	100
Zinc,	29.90	

Alloy for Types.‡

Lead,	80	100
Antimony,	20	

Alloy fusible in Boiling Water.

Bismuth,	8	16
Lead,	5	
Tin,	3	

Alloy for Plugging Teeth.§

Bismuth,	8.	17.6
Lead,	5.	
Tin,	3.	
Mercury,	1.6	

Alloy for Tinning Iron.

Tin,	8	9
Iron,	1	

Alloy used to make Ductile Gold of 18 carats, or 950 milliemes.‖

Copper,	990	1000
Gold,	10	

Alloy for Bells of Mantel Clocks.

Copper,	75	100
Tin,	25	

Alloy for the Pivots of Artificial Teeth.

Platinum,		
Silver,		

Alloy for ditto.¶

Palladium,	50	100
Silver,	50	

* The proportions here indicated having been found by analysis, it is evident that the tin is present by accident.

† This alloy of brass is important, and is due to Mr. Chaudet.

‡ Sometimes a small quantity of copper is added to these two metals.

§ This alloy may be prepared with a smaller proportion of mercury; it melts at 65° of the Centigrade scale.

‖ The previous combination of the alloy is found to produce ductile gold, when the same metals would prove the contrary, if mixed directly.

¶ This alloy is extremely important; it is used for all those purposes in the fabrication of philosophical instruments, for which platinum was formerly ap-

Alloy for the Springs of Artificial Teeth.*		
Palladium,	50	160
Silver,	50	
Copper,	50	
Iron,	10	
Solder for Gold of 750, or 18 carats.		
Gold of 750,	2.00	3
Copper,	0.50	
Silver,	0.50	
Solder for Silver of 750.†		
Silver,	2	3
Brass,	1	
Solder for Brass.		
Copper,	50	100
Zinc,	50	
Solder for Lead.		
Lead,	2	3
Tin,	1	
Amalgam of Gold for Gilding on Metal.		
Mercury,	91 to 89	100
Gold,	9 to 11	
Amalgam of Silver.		
Mercury,	85	100
Silver,	15	
Amalgam for taking impressions of Seals.‡		
Copper,		
Mercury,		
Amalgam for Silvering Mirrors.		
Tin,	70	100
Mercury,	30	
Amalgam for Silvering Globes of Glass.		
Mercury,	80	100
Bismuth,	20	
Amalgam for the Cushions of Electrical Machines.		
Mercury,	2	4
Tin,	1	
Zinc,	1	

Among the twenty-three metals that are not enumerated in the foregoing list, there are several that enter into alloys, but they are without utility in the arts; we should not, however, include in the

plied, being superior to it in hardness and colour, and yet inoxidable under all the usual circumstances.

*** An extremely useful alloy, having a degree of elasticity only exceeded by steel, with all the advantages of superior lightness and hardness over platinum; this, and the preceding, are due to Mr. Percival N. Johnson, of London.**

† The copper and zinc ought to be taken in the form of brass; for two parts of silver, take one part of brass.

‡ This amalgam is hard, and melts at a low heat; it was used by the French police, under the administration of the celebrated Fouché, for the purpose of opening and resealing the letters that passed through their hands.

remark, the native alloy of Osmiun and Rhodium, which is excessively hard, and is at present used for the nibs of metallic pens.

Care has been taken in the arrangement to name those metals first, which enter in the largest quantities in the alloy.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Observations on the Ailanthus Tree.

The Journal of the Franklin Institute is principally devoted to the arts, and mechanical science, but its plan and object comprehend occurrences in agriculture, and other branches of industry, connected with the wants and resources of our country; and the intimate connexion that exists between increasing the raw material, and the prosperity of the arts and sciences, will, we presume, secure to the following "sylvan" article, the attention of those who are interested in land, as earnestly as those connected with trade.

It is only a few years, since the good sense and patriotism of some commander of a private merchant ship, brought to this country the tree known by the different names of Ailanthus, and tree of heaven. To account for these names is not now our business, and it is from our not knowing the name of the citizen to whom the country is indebted for its introduction, that we are prevented from making honourable mention of him. Our object is to present to the public a few observations on the phenomena connected with the Ailanthus.

In the winter of 1826-27, four of these trees were planted on the same day, and under the same circumstances, with a great variety of other trees; they have, in a surprising degree, outstripped all of them in growth, as will appear by inspecting the table that accompanies this paper.

In the summer of 1832, a branch was sawed from one of these trees, at the distance of six feet above the ground. A piece was cut from the end of this branch nearest to the tree, and has been preserved in a dry place. In seasoning, it has rent in some places; it has lately been split, and planed; it takes a very smooth surface, is hard and heavy, properties that could not be expected in so rapidly growing wood. The appearance of the wood has in it all the promise of its having important good qualities, and that it is destined to be useful in the arts.

We have not yet had experience sufficient to determine the soils and situation most congenial to its growth; but in the places where it has been planted, it has thriven remarkably, and in rapidly making wood, appears to surpass all the other trees, native and imported. It leaves behind it both the weeping willow, and the Lombardy poplar; in beauty, it is superior to the latter, and, at least, equals the former; and it possesses, to an extraordinary extent, the property of propagating itself by its roots.

From the yet limited observations that have been made on this tree, these facts are sufficient to recommend it to the attention of land-owners, and, we think, to induce them to commence its cultiva-

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Palladium,	50	160
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Iron,	10	

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Copper,	0.50	
Silver,	0.50	

Solder for Silver of 750.†

Silver,	2	3
Brass,	1	

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Copper,	50	100
Zinc,	50	

Solder for Lead.

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From the yet limited observations that have been made on this tree, these facts are sufficient to recommend it to the attention of land-owners, and, we think, to induce them to commence its cultiva-

tion, by planting a few acres of it. Independently of its high promise as lumber, it is likely to be good fire-wood, and must, in the shortest period of time, yield more, as charcoal, than pine, oak, &c.

All these circumstances, we hope, will secure for it a fair trial.

The piece of the wood referred to will be left, for inspection, at the Hall of the Franklin Institute.

The following table shows the individual and average circumference of forty-seven trees, of twenty-one different kinds, the most prospering of a large number that were planted in the Philadelphia Cemetery, in January, 1827.

		No. of individual trees meas'd.				Aver. in.
Ailanthus,	Glandulosa,	31¾	34	29	29½	31.06
Weeping Willow,	Salix Babylonica,	33		27½	15	27.37
White Maple,	Acer Daysicarpon,	20½	25½	29½		24.71
Tulip Poplar,	Liriodendron Tulipifera,	14½	19½	22		22.68
Catalpa,	Catalpa Cordifolia,	21	26	13¾	26½	21.81
White Walnut,	Inglans Cinerea,	8	16	13	11¼	12.06
Honey Locust,	Gleditschia Triacanthus,	20¾	15			17.87
Buttonwood,	Platanus Occidentalis,	16	25	22	30	23.25
White Oak,	Quercus Alba,	13¼	13¼			13.25
Native Mulberry,	Morus Rubra,	8½	8½			8.50
Chesnut Oak,	Quercus Mentana,	8	8			8.00
Red Oak,	Quercus Rubra,	9½	9½			9.37
White Ash,	Fraxinus Americana,	11	10½	8½		10.00
Spanish Oak,	Quercus Falcata,	9½	11½			10.37
Balm of Gilead,	Pinus Balsamea,	5½				5.05
Aralia,	Aralia Spinosa,	6½	6			6.25
Hemlock,	Pinus Canadensis,	5				5.00
Gum,	Liquidamba Styriaciflua,	10½				10 05
Deciduous Cypress,	Cupressus Disticha,	11½				11.05
White Pine,	Pinus Strobus,	10¼	11			10.62
Sumach,	Rhus Typhinum,	15				15.00

The trees were procured from Mr. Robert Carr, of Bartram's garden, and planted by the late Mr. Hibbert.

The soil they grow in is the loam common to the site of Philadelphia, and the upland portion of the townships of Moyamensing and Passyunk.

The measurement was taken at the height of six feet above the surface of the ground. J. R.

On the most Eligible Arrangement of Railway Machinery. By William M. Cushman, Civil Engineer.

TO THE COMMITTEE ON PUBLICATIONS.

An erroneous disposition of those parts of railway carriages which involve the principle of the wheel and axle, may cause the loss of so large a per centage of power,* as to determine the success of a road

* By *loss of power*, our correspondent would no doubt have us to understand a *diminution of useful effect*. Com. Pub.

otherwise judiciously constructed; yet present opinions respecting the size of greatest efficiency, conflict very much. This result is perhaps traceable to the propensity to dispose of a matter which may be rigorously calculated, entirely by the judgment, so often egregiously at fault in kindred questions. But it is no part of the design of this paper to enter upon the metaphysics of a Gordian knot; whatever may be the origin of existing diversity of opinion, it is certain that the size which, *cæteris paribus*, permits the ratio of the neat load to the motive force employed in its transport, to stand the highest, is *that alone* which it avails aught to discuss, since it yields the highest useful effect with a given power.

The first consideration having a decided bearing upon the resolution of this question, is, that railways, in common with other machinery, only permit the transport of weights ranging within certain and fixed limits; few roads would long sustain the transit of loads exceeding three or four tons in gross, upon cars having but four wheels, and the lesser load is the conventional limit in reference to which roads are oftener constructed than to any other.

2dly. The obvious reason for employing the wheel and axle is to diminish friction; now, the wheel may be conceived *so small*, that no useful result will come of its employment; again, since the weight and dimensions are necessarily increased as its diameter is enlarged, the limit of strength exacts a synchronal diminution of the load. When, then, the weight of a wheel reaches this limit, it is clear that no useful result can come of the use of the power of the wheel and axle. Between these extremes, then, it is plain, *there is* a size more efficient than any other. To determine this size, let

$\frac{x}{c} = \frac{x}{6600} = \frac{1}{b}$ = quotient of weight of body of car, and its gross weight;

w = weight of wheels;

$\frac{1}{t}$ and $\frac{1}{a}$ = ratios of friction at the periphery and axle, respectively, to gravity;

r, r' be radii, the former of the wheels, the latter of their axles;

m = sine of inclination of grade;

T = absolute force of traction; and

E = ratio of neat load to T;

then, agreeably to what has been advanced, there results—

$$E = \frac{c - \overline{w + x}}{T}$$

and from well known principles, $T = \overline{c - w} \,|\, . \frac{r'}{a\,r} + \frac{c\sqrt{R}}{t\sqrt{r}} \pm m\,c$;

whence—

$$E = \frac{c - \sqrt{w + x}}{\sqrt{c - w}\left|\frac{r'}{a\,r} + \frac{c\sqrt{R}}{t\sqrt{R}}\right. \pm m\,c};$$

but since w does not vary in the simple ratio of r, it becomes necessary so to express it, that at every change of r it may be truly expressed. If the material of the wheels is cast-iron, known principles give $W = \frac{16}{3}\sqrt{r^3} + 24\,r^*$ very nearly; whence, on eliminating w from the last expression, by this value, it ultimately takes the form—

$$E = \frac{c - \frac{16}{3}\sqrt{r^3} - 24\,r - x\dagger}{\sqrt{c - \frac{16}{3}\sqrt{r^3} - 24\,r}\left|\,.\,\frac{r'}{a\,r} + \frac{c\sqrt{R}}{t\sqrt{r}}\right. \pm m\,c} \quad (1)$$

This is to be a maximum, and, therefore, the differential to be made equal to zero; whence, on actually differentiating and substituting known values of R, a, and t, the radius of maximum efficiency is expressed by the subsequent equation, viz:

$$\frac{5}{9} + r^{\frac{1}{2}}(1 - m\,bx) - 15\,r^{\circ}\,m\,bx - r^{-\frac{1}{2}}\,x\left(.09\,b + \frac{r'}{12}\sqrt{4b+1}\right)$$

$$-\frac{3\,r^{-1}\,.r'\,bx}{2} + \frac{33\,r^{-\frac{3}{2}}}{4}\sqrt{b-1} + \frac{r^{-2}\,.r'\,bx^2}{32}\sqrt{b-1} = 164 \quad (2)$$

If $2\,r' = 1\frac{1}{3}$ inches; $x = 400$ lbs., and $m = .004$, the numerical valuation of equation (2) gives $r = 21\frac{1}{3}$ inches; that is, the diameter whose efficiency is greater than any other, on a road whose inclination is 21.12 feet to the mile, and adapted to the transit of gross loads of three tons, is $42\frac{2}{3}$ inches.

If this value of r be substituted in equation, (1,) there will result 130.2 for the value of E, when it is a maximum. The substitution of any other value of r, whether greater or less, ought to give E a less value than this.

To compare the performances at other sizes, I have computed them for the several sizes detailed below, and tabulated the results. The expense varying as the effects inversely, the column headed relative

* The number of arms is taken at sixteen, and the weight of car at three, tons in the determination of these numerical coefficients.

† The negative sign does not obtain, because, to compare the neat load with the force actually requisite on the descent, is improper, inasmuch as the power adequate to accomplish the ascent must accompany the descending trade, though it be not actively employed. Thus, the mean effects are virtually the same as the ascending ones, and + m becomes, in general, the only value eligible in the solution.

expense will show, by inspection, the per centage of power *lost* by the *departure either way* from the size answering to the maximum effect; this will place the subject in a clearer light with those to whom the necessary employment of the higher calculus has rendered it less intelligible.

Diameter in inches.	Effects.	Relative Expense.
80	114	114
72	119	109½
60.5	125	104
50	127	102½
42⅔	130.2	100 maximum.
40.5	125.8	103½
36	124	105
30	119.2	109
24.5	112	116
18	109	121

Thus, if the size be *enhanced* to 50 inches, a *loss* of 2½ per cent. ensues; if to 60½ inches, 4 per cent., &c. Per contra, if it be *diminished*, at 40½ a *loss* of 3½ per cent. follows; at 36 inches, 5 per cent.; at 30 inches, 9 per cent.; at 24½ inches, 16 per cent., &c.

Agreeably to the nature of maxima, small deviations either way from the value of *r*, when E is a maximum, ought to produce but slight changes in the result; this is conformable to the table, where a departure of an inch is found to have no very sensible influence upon the effects, while greater deviations show a rapid loss. Economy in construction determines, however, when a slight difference is made, that it be within, rather than without, the size answering to the maximum.

The constants assumed in resolving the equations numerically, being mean values which obtain on most well constructed railways, the deviations from the tabulated results will commonly be insensible. With due deference to the views of others, we therefore think it conclusively shown, *that a wheel of three and a half feet in diameter is better adapted to railways than any other size whatever*, as a general rule; when locality, or the purposes of a road, render the data different, the change in the theorems already given is sufficiently obvious.

Albany, September, 1835.

FRANKLIN INSTITUTE.

Committee on Science and the Arts.

Report on Mr. J. K. Smith's self-acting Brake for Rail-road Cars.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania for the promotion of the Mechanic Arts, to whom was referred for examination, a self-acting Brake for Rail-road Cars, invented by Mr. J. K. Smith, of Pottsville, Schuylkill county, Pennsylvania, REPORT:—

That this invention consists in a rod, or slide, attached to the front

part of the frame of the car, which is pressed in whenever the car comes in contact with the one before it; the motion of this slide brings the brakes into contact with the wheels, by means of a suitable arrangement of levers, or by a chain passing around a pulley. As soon as the contact of the cars ceases, the brake is freed, either by its own weight, or by a spring.

As Mr. Smith claims the principle of acting upon the brakes by the contact of the cars, and has proposed several different modes of effecting this, it is unnecessary to describe any particular arrangement.

The principal advantages of this invention are, that it will relieve the engine from the pressure of the train, when about to be stopped, and will prevent the hinder cars from rushing upon those in front, should their speed be suddenly checked by any casualty, and may thus prevent the lamentable effects with which these accidents are frequently attended. It occurred to some members of the committee, that these brakes might produce an unpleasant jerking when starting or stopping, and when travelling over a curved or an undulating road; but they are informed that several of them have been in use upon the Little Schuylkill Rail-road for some months, and that no such unpleasant effect has been experienced. There is, however, one difficulty attendant upon the use of this contrivance, for which no remedy has been suggested. Whenever it becomes necessary to back the train, all the brakes must be thrown out of gear, and the time consumed in this operation may be of the greatest importance at a critical juncture. Notwithstanding this objection, the committee are of the opinion that the use of this brake will tend to diminish the danger of rail-road travelling, and they would recommend a trial of it to those who are concerned in that mode of transportation, believing that it will be found worthy of their attention, both in a benevolent and profitable point of view.

By order of the committee.

WILLIAM HAMILTON, *Actuary.*

August 15th, 1835.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN MARCH, 1835.

With Remarks and Exemplifications, by the Editor.

1. For an *Oil Bush and Cap Neck* for mill-stones; Jesse Kinman, Clinton, Lycoming county, Pennsylvania, March 2.

The oil bush here alluded to is to be made of cast-iron, and to be let into the stone. A rim rises round its outer edge, and also around the hole in its centre, to enable it to contain oil; four blocks of hard wood, or of some suitable metal, are made to slide between cheeks, to embrace the spindle, against which they are made to bear, regularly, by means of wedges. The cap, to keep out the dust, is particularly described, but as there is no claim made to this, or any

other part, we shall not dwell upon it; we are told that a part of the apparatus, "the metal collar, and the harness collar, is not considered as part of the improvement," and, of course, every thing else that is described is considered as new, even the hard wood, or metal, blocks which are to embrace the spindle.

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2. For an improvement in the machine for *Packing Flour* in barrels; John Kinman, Hartley, Union county, Pennsylvania, March 2.

A shaft is to be made to revolve vertically, which shaft has at its lower end four round spindles, projecting out from it at right angles, and, consequently, forming a horizontal cross; upon these four spindles are to be placed four conical rollers, which are to revolve freely on them; each roller is to be five and a half inches in length, three inches in diameter at its inner, and eight at its outer, end. The end of the shaft is to pass into the barrel, and the flour to be conducted into it by means of a trough, or spout, connected with the meal chest. Instead of making the shaft to revolve, it is said that the barrel itself may be carried round by suitable machinery; in either case, a vertical motion must be given to the shaft as the quantity of flour increases in the barrel.

We do not think the machinery represented in the drawing, and described in the specification, is the best that might be devised for the purpose; the claim, however, is not to this particular arrangement, but to "the machine for packing flour, as described, unconnected with the machinery for putting it in motion, as that will have to vary according to the situation of the machinery of the mills in which it is placed." By the machine, we presume, from the context, that we are to understand, the packing by means of the revolving rollers.

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3. For a *Plough;* Joseph Tinkler, Warwick, Tuscarawas county, Ohio, March 2.

This machine is rather complex, as it is to consist of two perfect ploughs, united together,and attached to the same beam; these ploughs are to be brought alternately into use, and, to effect this, the beam must be shifted at the end of the furrow, in a manner described in the specification.

"The plough is designed for both a hill side and flat land plough. It may be used as a common, or double, plough. The method of turning or changing it from point to point, is simply, at the end, instead of going round a piece of ground in the usual way, raise the pin, and when it is up, turn your team, and when the beam has moved a little way from its place, you may let go the lever, and when it is sufficiently round, the pin will drop into a hole in the opposite side of the neck. In turning, the point that was in the ground rises, and the other falls, when you may return by the same furrow which you came."

"That part of the plough which I claim as my invention, is the combination of two perfect common ploughs in one, with the point of

one elevated, whilst the other is in the ground; the revolving neck, and the principle of moving the handles from side to side, at pleasure."

We have not attempted to give a particular description of the arrangements by which the object in view is to be attained, as this could scarcely be done without a plate. Double ploughs, with shifting beams, have been patented, but the manner of attaching them, and the auxiliary arrangements, as presented to us in the specification before us, differ materially from any which have been heretofore adopted.

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4. For a *Stone Eradicator;* John C. Blauvelt, Newtown, Fairfield county, Connecticut, March 2.

This instrument is, essentially, the common hook and lever, used for rolling logs at saw-mills, for removing stones, and for various other purposes; the patentee claims to have improved it by the particular curvature which he gives to its two essential parts, the manner of arranging the toes, or claws, and the application of the power of animals, by attaching them, when necessary, to a link, or clevis, at the end of the lever. He says, "I do not claim to be the inventor of a hook and lever to raise stones out of their beds in the earth, but what I do claim as new, is the manner in which I have arranged and combined the hook and lever, and the manner of applying animal power thereto." The improvements alluded to do not appear to be of a very substantive kind.

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5. For a *Lever and Dead Weight Propelling Machine;* Luke M. Edwards, Gibson county, Tennessee, March 2.

There is some ingenuity in the contrivance of this affair, but, unfortunately, the whole praise due to it ends there, as a worse arrangement for the application of animal power to drive machinery could not well be devised by the most inverted intellect. A lever, or sweep, is to be drawn round by a horse in the ordinary way, and is to turn a shaft which carries a spur wheel, the teeth of which take into a lantern, or wallower. The sweep and horse walk are above the large spur wheel, and work upon a pin descending from the top of the building, being altogether detached from the shaft of the main wheel. This shaft has a gudgeon at its lower end working in a step; the shaft itself, however, does not stand vertically, but is inclined from the perpendicular two and a quarter inches to the foot, and the main spur wheel, which is to stand horizontally, is attached to the shaft at the same inclination, and with a corresponding eccentricity. The upper gudgeon of the shaft is made very long, and, instead of running in a box, bears against the side of a circular hole, or opening, in the centre of the floor upon which the horse is to walk, which hole is of such size as will admit of the spur wheel standing horizontally. The lever, or sweep, bears against the gudgeon, or prolonged shaft, and pushes it round. The axis travels, therefore, not like that of the earth in its annual orbit, but, although somewhat faster, like the

same axis in causing the precession of the equinoxes, and, by this intricate and queer contrivance, the spur wheel preserves its horizontality, and its periphery revolves in a circle. A "dead weight is to be placed on the rim of the spur wheel," which is to operate we know not how, unless it be to keep the upper gudgeon in contact with the periphery of the hole above named.

The patentee has some notion of a gain of power from this arrangement, but we are unable to perceive in what way he has reasoned to deceive himself, although it is manifest that he has effectually done so. The following is his claim.

"I claim the application of the lever to the top end of the shaft, and the top end of the shaft moving round in the circle with an inclination of two and a fourth inches to the foot; and the application of dead weight, instead of *lein*, [?] on the virge of the wheel."

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6. For a mode of *Sustaining the Weight, and Applying the Power, in Wheeled Carriages;* Samuel Chapman, Windsor, Berkshire county, Massachusetts, March 2.

(See specification.)

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7. For an improvement in the mode of *Casting Chilled Rollers, and other Metallic Cylinders and Cones;* James Harley, Pittsburg, Allegheny county, Pennsylvania, March 2.

(See specification.)

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8. For a *Cook Stove;* Joel Rathbone, city of Albany, New York, March 6.

After stating that inconveniences have been experienced from the construction of the ordinary Jews'-harp, or flat cook stove, from the waste of heat, the burning out of the front oven plate, and the unequal distribution of heat through the oven, the patentee describes the improvements by which he proposes to obviate these inconveniences; they are, "First. In recessing, by a curve line, or sweep, so much of the front furnace plate as lies below the kettles, in such manner as to bring the face thereof more or less under the bottom of the kettles; and secondly, in opening on the back side between the furnace and the oven, and between the flue that passes over and the flue that passes under the oven, a horizontal passage for the air to circulate through."

The claims made are to the foregoing improvements, which are very distinctly represented in the drawings that are deposited in the Patent Office.

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9. For an improvement in *Cutting the top part of a Horse Hame Collar;* Timothy Deming, East Hartford, Connecticut, March 6.

"The top, or casing part, of the collar is to be cut in four pieces, to be united at the centre, or bottom, and upon each side, nearly or directly under where the hame tug draws across the collars. The

place of uniting on the side to be sufficiently covered, to protect the same."

The foregoing is the whole description, and the claim is to the manner of cutting, as described.

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10. For an improvement in the construction of *Trip Hammers;* Heman Redfield, Grafton, Worcester county, Massachusetts, March 6.

This is a very trifling affair, consisting of a wheel, like a lathe wheel, turned by a treadle, a band from which gives motion to a whirl above, which has pins upon it that raise the handle of a hammer; a spring is used to bring the hammer down upon the anvil with a smart blow; the *inventor*, who, it appears, is a cordwainer, says that he has "employed it in hammering the soles of boots and shoes, and has ascertained that it operates with perfect success." As this hammer is tripped, it may certainly be called a trip hammer, although the name conveys the idea of a very different thing. The claim is to "the application of the spring to the arm, or beam, holding the hammer, by which the blow is increased."

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11. For a *Winnowing Machine;* Truman B. Brown, Locke, Cayuga county, New York, March 6.

What are called improvements in this apparatus, appear to us of so trifling a character, as not to demand the time and space which would be required to make them known.

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12. For an improvement in the machine for *Seaming the bottoms of Tin Plate;* James Redheffer, Bridgetown, Cumberland county, New Jersey, March 6.

A frame is made in which revolve two shafts, or spindles, geared together by cog wheels, and turned by a winch; these spindles carry two disks, or rollers, of steel, four inches in diameter, the lowermost of which has a plane cylindrical surface, and the upper a projecting flanch to turn the seam. The tin vessel, after passing through the paring machine, is then double seamed by means of that above described. The claim is to the method of double seaming by means of the rollers.

It is many years since we examined the revolving rollers and other machinery used in the manufacturing of vessels from tin plate, and we cannot aver that among them there were any disks for seaming precisely similar to the foregoing, although we are strongly impressed with the idea that such was the fact.

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13. For an improvement in the mode of *Catching Fish;* Charles Fowler, and Edwin R. Hanks, Hartford, Hartford county, Connecticut, March 6.

A *steam engine* is to be erected on the shore for the purpose of paying out the seine, and drawing the boats to the shore. Two

blocks are to be fixed out in the stream at such distance apart as shall be equal to the length of the seine, and at the centre point between these blocks, two others; corresponding blocks are to be placed on the beach, so that two endless bands, or ropes, may be drawn around them, forming, when in use, two quadrangles. The ropes on shore are to be drawn by the steam engine. Two batteaux, each containing one-half of the seine, are to be drawn from the shore to the centre blocks, where they are to be cast off, and again made fast outside of the blocks; by drawing upon the ropes, the seine is then made to pay out each way to the outer blocks.

"What we claim as our invention, is the drawing the said boats from the shore around their proper circuits for paying out the seine, and then to the shore, by means of steam power, in the room of rowing; and likewise said drawing in of said seine by said engine."

We think the foregoing form of claim exceptionable, as it merely refers to the use of steam for drawing a rope, or ropes, which certainly is not the invention of the patentees; the proper subject of the patent, we apprehend, is the arrangement of the ropes to enable them to effect the purpose intended, whether steam or animal power be employed.

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14. For *Manufacturing Brushes for Blending Colours;* George W. Morris, city of Philadelphia, March 6.

The patentee simply informs us that the hair which he has discovered for making blending brushes is taken from oxen, cows, or horses, that of a white colour being preferred; that he obtains it from those who prepare hair for the upholsterers, taking that which is of the stiffest kind; that it requires combing, and is prepared in the ordinary way of preparing hair for brushes, by bleaching.

Should a man take a shaving brush, such as is made from the kind of hair used by the patentee, and employ it as a blending brush, would he thereby subject himself to damages?

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15. For an improvement in the *Use of the Saw;* Anson Field, Jericho, Chittenden county, Vermont, March 6.

By the improved use of the saw, the patentee means an improved mode of fixing the saw for use, the purpose to which he proposes to apply it being, principally, the cutting of wood for the fire, in doing which he proposes to cut through a log at a single stroke, provided the saw be *long enough.*

Cheeks of wood, or iron, are to be fixed on each side of a saw, embracing it between them in such a manner that at one end the teeth shall rise but little above them, whilst at the other the blade is to project sufficiently to pass through a log. This is then to be placed between slides, so as to allow it to slide back and forth like the frame of a mill saw, "as may be most convenient," and "where thought best," "the timber to be cut confined to it as may be most convenient;" the saw to be moved "by means of any machinery thought best to attach it to." "By this process, a stick of timber of

any size may be taken off by one sweep of the saw, provided it be of sufficient length, and width at the back end. The saw may be graduated so as to cut from half an inch to two inches to the foot, according to the size and nature of the timber to be cut." "What I claim is the manner of confining it between the two slips; the way in which it slides, and the principle on which it cuts, viz: being so confined as to cut, at one sweep, the entire width of the saw above the slips."

We have thus placed before the reader the whole sum and substance of the *invention*, and it will be perceived that those persons who wish to carry it into operation, are left at ample liberty to devise the means of doing so. It is probable that a twenty horse power steam engine may suffice to work the saw, and cut through a nine inch log at a single sweep, a powerful screw press, or some analogous instrument, being employed to hold the log.

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16. For a *Thrashing Machine;* Thomas D. Burrall, Geneva, Ontario county, New York, March 6.

By an advertisement attached to the drawing of this machine in the Patent Office, dated January, 1834, it appears that more than three hundred of these machines were then in use, and in the lapse of a year it is probable that the number has been considerably increased. The law is, that if an inventor allows his machine to go into public use, or to be publicly sold for use, he has thereby abandoned all claim to an exclusive right. The thing patented must be *new* to the public. It must be confessed, however, that if the machine before us had been patented at the date above named, or even some years previous thereto, there would not have been any thing new in it, as may be inferred from the subjoined claim.

"What I claim as my improvement, is the cylinder armed with spikes, or teeth, or other similar projections from its surface, passing or mashing through corresponding teeth, or projections, in the concave; with racks, or skreens, in the concave for separating the grain from the straw."

The drawing, so called, requires a label to tell to what species it belongs; it is without written references.

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17. For an improvement in the *Mariners' Compass;* Jonathan Ball, Buffaloe, Erie county, New York, March 6.

The patentee concludes his specification with the following claims: "Rendering the card on both sides equally visible, as well from above as below, by means of the hemisphere of glass." This glass hemisphere is to take the place of the brass hemisphere, within which the compass card ordinarily plays. There is to be an opening through the deck, under the binnacle, that the steersman may see the card by the light in the cabin, whilst it is visible in that apartment also.

In the second volume of the new series of this journal, p. 129, there is the specification of an improvement in the mariners' compass, combining all the essential features of that now patented, with the

addition of perfect security to the instrument against injury by cannon shot, from its being contained within the thickness of the deck. The patentee in that specification says, "The compass box is made with a glass bottom, so that the card can be seen as perfectly in the cabin as upon deck; I also make the compass card translucent, in consequence of which it may be lighted from below; the compass is defended at top by a very thick piece of glass; the lower side of the box is also glazed, and I contemplate sometimes the making the sides of the box, of glass." The foregoing quotation from the patent of 1798 will show, clearly, the identity of the two contrivances; and, if report be true, the same thing had been in use on board of some British national vessels previously to the above date.

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18. For an improvement in the *Fishing Boat;* John Donn, city of Washington, D. C., March 6.

The advantage proposed to be obtained by the improvement in the fishing boat here patented, is, principally, an increased length of leverage for the oarsman. This is accomplished by extending wings on each side of the boat, from stem to stern these wings being carried out horizontally by means of knees, thus widening the upper part of the boat, whilst that portion of it which is in the water remains as usual. The oarlocks are, of course, placed on the outer edges of these wings, which have the ordinary finish of gunwales. Some incidental advantages from this arrangement are mentioned, such as securing the boat from the effects of the swell, and thereby lessening the risk of foundering; the increase of room, also, for the seine, which, as usually placed altogether in the stern, raises the bow out of the water. The claim is to the wing constructed as above described, and applied to a fishing boat.

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19. For a *Stove;* George J. Payne, Erie, Erie county, Pennsylvania, March 6.

This stove is to be made in the general form of the open Franklin stove, but to be adapted to cooking; for this purpose, the back is to be curved backwards at its upper end to increase the room, and an oven is to be formed, with doors opening in the front plate. The flue continues over the oven, under the top plate, where there is an opening for a pipe. Pans, or kettles, have also their appropriate openings. The whole is described in a very general way, nothing being said respecting the particular improvements made by the patentee, or in the way of claim.

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20. For a *Sausage Cutting Machine;* Peter Fahnestock, and John Monn, Jr., Quincy, Franklin county, Pennsylvania, March 11.

The meat in this machine is to be cut between two vertical disks, one of which is turned by a winch, whilst the other is stationary. One of these disks is made concave to admit the meat from a hopper, and they are both furnished with knives so placed as to pass each

other; towards the periphery the knives are more numerous than near the centre, the meat being fed through an opening near the axis, and delivered through another at the periphery. The claim is to the application of knives to a face wheel, and to the other parts which are necessary in the particular arrangement of such a machine. This differs from the sausage machines previously patented, which, we think, is its only peculiar merit.

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21. For an improvement on the Napier *Printing Press;* Michael Caton, and John C. Rives, city of Washington, D. C., March 11.

The improvement to which the foregoing title refers, is intended to make a more perfect register than has hitherto been done on the cylinder press.

It would require too much space to give a full description of the improvement referred to ,for, although it is in itself simple, it is connected with a machine of much complexity, and not generally understood. Two points are to be placed above the cylinder, and so near to it that a sheet will not pass between them and the cylinder when being put on, and in such places that the foremost corners of the sheet will rest against them. These points are to be geared to the shaft of the registering apparatus now in use, [Newton's,] so that it will raise them just at the moment the fingers of the press take hold of the sheet, and keep them raised until the sheet passes from under them, when they must instantly drop to their first position. By putting every sheet against these points, they will, if of the same size, have all their margins equal.

Two screws, each having on their heads the letter o, about the size of a long primer o, are to be screwed into one of the cross-bars of the chase, and these must be so regulated that the heads are exactly even with the type locked up in it, and at such place that they will make an impression upon the printed sheet about an inch from each edge of it. The impression made on each sheet in working off the first side, may be distinctly seen when the paper is turned to work off the second side.

On the inclined board on which the sheets are laid, to be taken off by the fingers of the press, two movable points are to be placed at the same distance apart with the screws in the chase, and the centre of the o made by the first working is to be placed exactly over these points, adjusting them so as to make register. A boy will be required on each side to lay on the sheets correctly, which habit will soon render easy.

Other modes, it is observed, of producing a like effect may be resorted to; types, for example, might be locked up in the chase, near to the cross-bars, as substitutes for the screws; but what is relied on, is not the precise mode described by the patentees, but the making register by producing a mark upon the sheet, with any thing connected with the chase.

22. For an improvement in *Grates for Burning Anthracite, &c.;* Barnabus Pike, city of New York, March 11.

This whole invention consists of a flat grate, which is to be used for fireplaces of all kinds, whether open or closed; the grate is made to slide upon bars, and has a handle to it by which it may be moved by a sifting motion, or drawn out sufficiently far to discharge the contents of the fireplace. The claim made is to "the horizontal grate and floor, as aforesaid, when employed in the use and management of heat, in whatever manner the same may be constructed and adjusted, whether used in stoves, fireplaces, or furnaces."

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23. For an improvement in the construction of *Tailors' Shears;* John Andrews, assignee of Rockus Heinisch, city of New York, March 11.

The upper side of the lower bow, or ring, of the shears is to be made flat, or widened out, so that the fingers which press upon it in the act of cutting, may exert their power without the inconvenience experienced in the uses of shears as ordinarily made. The claim is simply to the widening out this part, as described.

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24. For an improvement in the construction of *Water Wheels;* Robert Eastman, Concord, Merrimack county, New Hampshire, March 11.

The patentee calls this a "combined percussion and reacting wheel." There is a stationary cylinder which stands vertically, and within this is a second cylinder, less than the former, and fixed on gudgeons to revolve within it. On the lower end of this second cylinder is the reacting wheel, made in the form of Wing's and other reacting wheels; it has its upper edge even with the ordinary surface of the water in the river, or tail race, and fitting closely against the lower edge of the stationary cylinder. Above this reaction wheel there are floats on the revolving cylinder, extending upwards, and upon these the water is to strike on being admitted through a conductor, or trunk, opening through the stationary cylinder for that purpose. The water, it is said, will rise nearly to the height of the head in the space between the two cylinders, and thus act by its gravity upon the reaction wheel, with little or no loss of effect upon the percussion floats. The claim is to the before described arrangement.

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25. For an improvement in the *Water Closet;* James Stone, city of New York, March 11.

This improvement consists of a pendulous weight attached to a rod, and connected by joints to the pan of the water closet. The specification refers throughout to a drawing, which exhibits the plan very perfectly. The contrivance is very simple, and appears to be extremely well adapted to its purpose, without a liability to get out of order.

26. For an improvement in the manner of *Fastening Hames on Horse Collars;* Timothy Taylor, Jr., Purcel's store, Loudon county, Virginia, March 11.

The strap by which the hames are to be drawn together at the lower end, so as to tighten them on the collar, passes through a loop formed on a strip of iron which extends along one hame, and the other end of the strap hooks into a notch on an iron lever that lies against the other hame, and hooks to the other end of the strap. This lever turns on a pin near its lower end, and in so doing loosens the strap and the hames; and when returned against the hame to which it is attached, it draws and braces the strap at the lower end; the strap is furnished with a buckle by which it can be lengthened or shortened. The claim is to the foregoing apparatus.

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27. For a *Mortar Mixer and Mason Tender;* Samuel Whitman, Vermillion county, Illinois, March 11.

A carriage, having a resemblance to a wagon body, is to be placed upon wheels in order to move it from place to place; it may be about fourteen feet long, and six wide. Attached to it there is an inclined movable floor, upon which a horse, or other animal, may walk in order to give motion to the machinery, which consists of boxes, wherein the lime and sand are placed and sifted; a rake, moved by a crank, for mixing the mortar; pulleys and tackle for raising hods to the top of the building, and certain other appendages which may be required. The claim made is to "the manner of putting together the several parts as above described, on the principle laid down; or, in other words, the combination and arrangement of the parts."

Such a description and claim as form this specification, if they secure any thing, cannot embrace more than the particular arrangement adopted by the patentee, as there is not any thing new in the individual parts, and as analogous combinations have been repeatedly made.

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28. For a *Churn;* Benjamin Randal, North Pownal, Cumberland county, Maine, March 11.

To get up a really new churn would be no easy task, and we are not disappointed, therefore, in finding the one before us much like others which have previously passed in review. Double churns are common, but the present patentee makes the body of his an oblong square box, with two dashers, one near each end. The dasher handles are attached to a vibrating lever, supported on two standards, the vibratory motion being given by the turning of a crank shaft. A very particular description is given of all the parts; such, for example, as that the dashers are formed by two pieces of wood crossing at right angles, and halved into each other. The claims made serve to show the difficulty of pointing out any thing that is new, consisting of "the application of the standards to receive the bar which revolves between them, and in the formation of their lower ends, together with the cross wedges by which the top may be removed from the box, when these wedges are loosened."

29. For a *Horse Power;* William E. Arnolds, Chatham, Middlesex county, Connecticut, March 13.

This we believe to be a new mode of applying horse power to drive machinery; it is contrived with considerable ingenuity, but this, unfortunately, is no guarantee for its practical utility. The horse is to stand upon a platform made of slats, which, instead of being placed crosswise, as they are in the endless bands, extend longitudinally upon the basis of the machine; these slats are to stand edgewise, and are to be so thin, that the foot of the horse will cover the edges of three, four, or more of them; the slats constitute parts of two sliding frames, every other one being secured to its corresponding frame. These frames rest upon a kind of cam rollers, which, with the addition of certain cam, or eccentric, wheels, cause the frames alternately to rise against the feet of the horse, and to traverse backwards and forwards. The particular arrangement by which this is to be effected we shall not attempt to describe. The claim made is to the arrangement by which this new principle of constructing a horse power, is carried into operation.

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30. For a *Steam Wheel;* William Wilson, Henderson county, Tennessee, March 13.

This contrivance is beneath animadversion; the object, we are told, is to throw steam on a wheel without the intervention of "a injain." A wheel, like a tub wheel, is to be placed in a tube of wood, or iron, proceeding immediately from the boiler, a shaft from which, to drive machinery, may extend out to any required length. Grist mills, steamboats, and saw mills, are given as examples of the purposes to which the power of this improved steam wheel may be applied.

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31. For a machine for *Hulling Clover, Thrashing, and Shelling Corn;* Jesse S. Dick, Genesee county, New York, March 13.

It is scarcely to be supposed that the self-same machine will answer all the purposes to which it is intended to apply the foregoing, nor is this proposed, as certain operating parts are to be removed, and others substituted, accordingly as it is wanted for one or the other purpose. We have, on similar occasions, expressed a doubt of the correctness and safety of this procedure. The frame work does not constitute the machine, and if the essential working parts are to be changed, we think the inference that a new machine is thereby created, is inevitable.

For thrashing, there is a concave and cylinder, much of the usual construction, but some peculiarity in the formation of the teeth is claimed as new. A revolving fan is employed in each case, to drive off the chaff. The claims are to "the peculiar form of the teeth in the cylinder, with serrated or boarded edges. The revolving bars or shafts of the sieves, armed with long teeth, and furnished with springs. The arrangement of the parts so adapted to each other as

to allow of their being changed to use the machine for the purposes herein specified, not intending to claim the concave, cylinder, feeding apron, &c., separately."

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32. For an improvement on *Boats for Navigating Canals, Rivers, &c.;* Anthony Plantou, city of Philadelphia, March 18.

Mr. Plantou obtained a patent for constructing and propelling boats, &c., on the 23d of April, 1834, an account of which is given at p. 334, vol. xiv., to which we refer. The object of the present patent appears to be the giving greater buoyancy to the boat than could be obtained by means of the hollow propelling cylinder which he formerly proposed to employ. He still uses cylinders of a similar kind, crossing the boat from side to side, but under these he has a hollow water-tight bottom, as long and as wide as the boat, and of a foot or two in depth; between this hollow trunk, or false bottom, and that bottom on which the loading rests, the propelling cylinders are to operate. It is proposed sometimes to make the secondary bottom perfectly solid, its buoyancy then depending on its specific gravity.

The patentee says, "I claim as my improvement the immersed bottom, solid and made of strong timbers, or made hollow and water tight. And I claim the manner of confining the water between my supporters for canal navigation, so that the boat forms a kind of canal by itself."

Such a bottom would certainly give buoyancy to a boat, but there its advantages would end, although its disadvantages would be various; among them would be its abstracting from the depth of the water in which the wheels are to operate, so as in canals, and other shallow waters, to destroy their efficiency; it would, moreover, carry a good portion of its own load of water in its "kind of canal by itself," and in this way go far to reduce the effective action of the propellers from what it would be if they actually operated upon the water in the hold of a vessel.

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33. For an improvement in the mode of *Connecting Carriage Springs;* Amos Davis, Easton, Talbot county, Maryland, March 18.

The part improved is the movable joint by which the ends of the springs of carriages are attached to the brace, or elsewhere. The joint is to be so made as to appear and operate like a but hinge joint. This construction is said to prevent "the great annoyance produced by the constant clatter and rattling of those heretofore in use," and to allow the joint to be oiled with great ease.

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34. For a *Grist Mill with Small Stones;* Frederick Smith, Evans, Erie county, New York, March 18.

The improvement is said to consist in a "simple and easy method of applying pressure to the upper stone, or runner, and in regulating the stones while grinding." The machine is described by reference

to a drawing, in which it is very well represented. The claim is to "the power given by the lever and weight, through the medium of the slide, and bridgetree, to increase or diminish the pressure upon the runner; and also the power given by the same lever and weight to regulate the stones while grinding."

We were so heartily tired, some four or five years ago, with the numerous plans for applying pressure to the runner in such mills, as to be altogether averse to instituting further inquiries into the difference "twixt tweedle-dum and tweedle-dee." If these small stones, when driven with high velocities, do as good work, and as much of it, as those interested in the use of them have averred, we feel well assured that some of the plans formerly patented for weighting and regulating the stones, left little to desire in perfecting the mill. We doubt, however, from what we have learnt upon the subject, whether the best of them deserves greater praise than that of being a good make-shift.

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35. For a *Garlic and Smut Machine;* Thomas L. Sands, and Benjamin Hendig, Waynesborough, Franklin county, Pennsylvania, March 18.

The essential operating parts of this machine are three cylinders, named respectively the elastic roller, the picking cylinder, and the brush cylinder, each of which revolves horizontally. The elastic roller may be made of wood, and have its surface covered with one or more thicknesses of cloth, or leather, or both. The picking cylinder is also made of wood, and is covered with one thickness of leather; into this, so as to hold firmly in the wood, are driven numerous pointed wires, of about No. 30 or 32; they should be within about one-twentieth of an inch of each other, and project out about the same distance. These cylinders are on the same plane, and are geared together so as to turn towards each other, and the grain is fed between them by a suitable hopper. The brush cylinder revolves behind the picking cylinder, its gudgeons being elevated above the plane of the other two. The wheat which passes through between the two first cylinders is carried by an inclined board towards the front of the machine, and the garlic which is brushed off from the picking cylinder, descends another inclined board towards the back of the machine. The wheat, after passing through this first set of cylinders, may, it is said, be again subjected to the action of a similar set.

"Now, what we claim as new, and our invention, is the combination and use of the within described cylinders, operating in the manner, and for the purposes, herein set forth, varying the same in any way that we may think proper, provided the principle of operation remains the same; also, the using of more than one brush cylinder to each picking cylinder."

36. For a *Metallic Oxide, or Composition, to be used as White Paint;* Forrest Shepherd, Fredericksburg, Spottsylvania county, Virginia, March 18.

We are informed that "The metallic oxide of barium, commonly known in mineralogy as the sulphate of baryta, or barytes, is finely pulverized and mixed with oil, and as such is used as a paint, either without, or mixed with, white lead. What I claim as my invention in the above composition, is the reducing, mixing, and using the said composition, either as a substitute for white lead, or as an improved white paint, being mixed with white lead."

Were the foregoing application of sulphate of barytes new, it would undoubtedly be a proper subject for a patent, but as it has been repeatedly and extensively used for the purpose designated, and in the same way, the parchment will not protect it. The artificial sulphate of barytes is used in the finer kinds of painting, and is prepared and kept in the shops for that purpose, being the most delicate and permanent white known, remaining unchanged by those agents which injure, or destroy, the effect of the preparations of lead.

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37. For *Pannels for Carriages;* Ebenezer Lester, city of Boston, March 18.

(See specification.)

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38. For an *Ointment for the Cure of many External Diseases;* William Allen Gray, city of Richmond, Henrico county, Virginia, March 18.

"White swellings, ulcers of long standing, tumours, eruptions, burns and scalds, old and fresh wounds, callous and glandular swellings, &c. &c.," are among the affections which this ointment is to remove. The following is the recipe for preparing it.

"One gallon cotton seed oil; one gallon linseed oil; one quart sweet oil; one quart Canada balsam, or oil of fir; two pounds of mutton suet; one pound bees-wax; and five pounds sugar of lead."

We shall not add the directions for incorporating the ingredients composing this ointment, although they are given at large in the specification, nor shall we attempt an epitome of its virtues; the patentee stakes his *reputation* on its success in the cure of the bites of spiders, serpents, and mad dogs. Notwithstanding this weighty pledge, we are very apprehensive that the patentee would feel that he had something more at stake, maugre his ointment, were he bitten by a rattlesnake, or a mad dog. The virtues of this composition are dependent upon the sugar of lead, and those who require its use may obtain sugar of lead ointment ready prepared at the apothecaries'. It is useful in burns and ulcers, but for most of the purposes mentioned in the foregoing list it would be worse than worthless, as a dependence upon it would prevent the adoption of the proper remedies. The mixture of cotton seed oil, &c. &c. &c., to form the body of the ointment, is sheer quackery, as sweet oil, bees-wax, and turpentine, properly combined with the sugar of lead, would produce an article

which it would puzzle the patentee to distinguish from his own composition, and which would possess all its virtues.

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39. For a *Machine for Making Wrought Nails;* Samuel G. Reynolds, Providence, Rhode Island, March 18.

From the nature of this machine, it would be useless to attempt to furnish an intelligible description of it without a drawing; the following is the claim made, which will give a general idea of the improvements depended upon to sustain the patent.

"Although there are many parts of this machine which are well known, there is still a characteristic difference between it and other machines for making wrought nails, resulting from the general combination and arrangement of its parts, as will be apparent to every competent machinist; I therefore claim as my invention, the general arrangement and combination of the respective parts of this machine, as described; and among the individual parts I claim, particularly, the employment of perfectly round, or cylindrical, rolls, marked Z Z in the drawing, employed for giving a proper slope to the shanks of the nails; these rolls being brought up against them by means of progressive levers, as herein described, or in any other way by which they are made to produce a similar effect, and operate as substitutes for such rolls, or eccentrics, as have been used in other nail machines, in which the form of the shank is given by depressions cut into the faces of such rolls. The contrivances by which such a progressive motion may be given to the cylindrical rolls are numerous; I have not, therefore, thought it necessary to attempt to detail them, but have described that which I esteem the best, and which I have employed in my machine."

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40. For a mode of *Furrowing or Dressing the disk-like faces of Metallic Mills;* Samuel G. Reynolds, Providence, Rhode Island, March 18.

(See specification.)

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41. For a *Thrashing Machine;* David G. M'Coy, Dublin, Harford county, Maryland, March 20.

There is to be a feeding apron to carry the grain to the cylinder, which cylinder is to be fluted from end to end, the flutes being in the form of saw teeth; besides these flutes, short teeth, or points, are to be driven into the cylinder, which are to project a little beyond the edge of the flutes. The concave is to be fluted from end to end with saw tooth flutes, but as the thrashing is to be effected by a rubbing process, the teeth of the cylinder descend in the manner of a cutting saw, but meet those on the concave in a reversed direction, what may be called the cutting edges of the flutes standing from the cylinder's motion. Across the feeding apron, just where the grain enters under the cylinder, a strip, or beater, is to work up and down after the manner of the comb in a carding machine, in order to force down the

straw, and prevent any tendency to its accumulating. This strip is worked up and down by the action of a toothed wheel.

"What I claim as my invention is not the form of the teeth, or flutes, on the cylinder, nor of those in the concave, when used of a similar shape, but their reversed position as described. I also claim the application of the comb, or strip, rising up and down to perform the operation and intent already set forth."

As regards the-saw like form of the teeth on the cylinder, this was the subject of a special claim in a machine recently patented, and if that claim was then good, it cannot be eluded by the form now given to the contrivance.

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42. For a *Press for Hay, Cotton, Hops, &c.;* Samuel F. Baker, Graham, Cumberland county, Maine, March 20.

The patentee of this machine apprehends that he has doubled the power which he applies, by the reaction, as he terms it, of two followers one upon the other. The articles to be pressed are enclosed within a suitable box, and by turning a power wheel, furnished with pins, or rounds, for that purpose, shafts which cross the press are made to wind or unwind ropes, so as to move the followers, there being a gearing of wheels and pinions for that purpose, which is fully represented in the drawing. The patentee says that "A machine constructed with this two-fold power, or the reaction of one follower upon the other, arising from the operation of one upon the other with ropes, cogs, or chains, can be made one of the most powerful engines of compression, without injury to the machinery."

"What I claim as my own invention, is the application of the two horizontal shafts in the manner described, the reaction they produce in forcing the followers up and down, and the operation of the machine with regard to the double applied power, or with the action of one shaft forcing the followers up and down at the same time."

If the patentee has not yet discovered his error, it is because he has not built and fairly tried an operating machine.

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43. For an improvement in the *Power Loom;* David Whitman, Willimantic, Windham county, Connecticut, March 20.

"The improvement consists of a roller one and a half inches in diameter, with bearings at each end, running in boxes fastened to the breast beam, or front girth of the loom, and revolving by the motion of the cloth which passes over it; the object of which is to lessen the friction of the cloth as it passes from the reed in the lathe to the cloth beam, and to give the cloth an easy vibrating motion; also to have the cloth clear the breast beam, that it may at each stroke of the lathe move easily each way."

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44. For *Wheels for Rail-road Cars;* John Baker, Lancaster, Lancaster county, Pennsylvania, March 20.

The body of this wheel is to be made of wedge formed pieces of wood, extending from the hub to the rim, or tire, the grain of the

wood being in that direction. What are called hub plates are used to embrace the wood on each side, around the hub, bolts passing through from one to the other. The rim also is bolted to these plates, they having a flanch cast on them for that purpose; these bolts cross from the outer edge of the rim to the inner hub plate, and from the inner edge to the outer hub plate, × fashion.

"The axle is let its full size into the hub for one-half the distance, when it may be shouldered off, or reduced, as may be desired." There is no claim made, and what it is intended to patent must be inferred from the foregoing description.

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45. For a *Cooking Stove*, denominated the Franklin Cooking Stove; Isaac M'Nary, Stafford, Tolland county, Connecticut, March 24.

This stove is made in the general form of the open Franklin stove. A boiler fits in on the top plate, and an oven is formed behind the stove, much in the manner of some others; these parts are not claimed as new, the following constituting the invention. A grate which is to contain the fire stands ordinarily upon the bottom plate of the stove, but this may be raised by a shaft which extends across the upper part of the stove, from side to side, above the grate, and is furnished with a winch; from this shaft a chain connects with the grate on each side, and it may, therefore, be elevated, with the contained fuel, and the heat be increased or diminished at pleasure. The claim is to "the lowering and raising of the grate and hearth by means of the above mentioned wheel shaft and chain."

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46. For a *Washing Machine;* Stephen A. M'George, Alexander, Genesee county, New York, March 24.

This is a formidable washing machine, as will appear by the following claim.

"What I claim as my invention, and not previously in use, in the above machine, is the connection of a partition in the centre of the box, or tub, thereby forming two apartments in the tub of said machine, where washing may be done in one, and rinsing in the other, at the same time. Also the application of six pounders, more or less, with upright standards made of metal, with cogs thereon; also cog wheels connected therewith, and the top or cap of the box being connected by a strap or cord with the top piece horizontally placed on the top of the post, with a pulley and crank attached thereto, and centrally placed upon the post of said machine for the purpose of raising the six pounders, crank, shaft, and cog wheels, altogether from one lid of the tub a sufficient height to turn them on the post contrarily placed in the said tub, forming a half circle by turning them to the opposite side, and letting them down into said tub, all of which I claim as an improvement in a washing machine."

Should any one wish to know more about the foregoing, we refer him to the Patent Office.

47. For improvements in the *Steam Engine;* John Murphy, city of Philadelphia, March 24.

This patent is taken for the manner of constructing a boiler, and for a new mode of working slide valves. The boiler consists of two receptacles for water, which are to be combined together by tubes that are also to contain water. One of the receptacles forms the front, and the other the back end of the boiler, the furnace being contained between them; they consist of shallow sheet-iron boxes, but of the height and width of the furnace, and having their tops and bottoms arched. Numerous tubes extend from one of these to the other, and pass through them, so as to be secured on each side by nuts; they have slots, or openings, through them, within the receptacles, allowing the water to flow freely from one to the other. One row of these tubes is placed under the furnace, so as, in part, to constitute the grate bars. The fire is fed through one of the receptacles, which is perforated, cased, and furnished with doors, for that purpose. A steam tube connects the upper ends, or steam chambers, of the receptacles.

The patentee observes that "In the ordinary mode of working the slide valves in locomotive and many other steam engines, by means of an eccentric, surrounded by a band, or ring, the motion of the valve is continuous; but in the method which I have adopted, the slide is at rest during every quadrant of the revolution of the cam shaft, by which means the admission and escape of steam are greatly facilitated, and the action of the engine improved."

"What I claim as my improvement in the steam engine, is the manner of constructing a boiler, or generator, with two receptacles connected by tubes passing from one of them to the other, formed and combined together substantially in the manner herein described. I also claim the manner of working the slide valve in locomotive or other steam engines, by means of a cam operating in a frame, in the way, and for the purpose, herein set forth; not intending, however, to limit or confine myself to the exact manner of arranging the parts as represented in the drawings, but to vary them as I may think proper, whilst the same principle of action is retained."

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48. For an improvement in *Steam Engines;* Job Sheldon, New Haven, Connecticut, March 24.

This is a rotary engine, in which a piston is to revolve in a circular chamber, or hollow rim, which it is proposed to make about three feet in diameter, ten inches deep, and four inches broad, and it is calculated that this will be a twelve horse engine. One side of the circular chamber forms a wheel, to which the piston is to be attached, and to revolve with it. Upon a shaft connected with this wheel, there is also a balance, or fly, wheel. There are, of course, an induction and an eduction pipe; a hinged valve filling the section of the chamber, and which is to be raised by the piston as it revolves, is placed as in many other rotary engines.

There is but little novelty in the whole arrangement, the engine

being substantially the same with others which have preceded it. None of the difficulties presented in the construction of such engines appear likely to be overcome in this. Such, however, is not the opinion of the patentee, who says that it "is more simple than those in ordinary use;" and if by this he means the rotary engines in ordinary use, we know not where to find them. The claim is, "specially, the stationary circular chamber, and the revolution of the piston therein, and its connexion with the wheels as above described. And also the application of the inner valve, and the discharging orifice, as described."

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49. For an improvement in the art of *Grinding Stone, Glass, and Metallic Surfaces, to perfect and polished planes;* George Cooper, city of New York, March 24.

This "improvement in the art," it seems, means an improvement in the machinery for grinding; the apparatus described appears to be intended for the grinding and polishing of round marble table tops, but is to be employed in grinding articles in other forms, and of other materials. The grinding is to be performed upon a tub wheel, which is so called from its consisting of a round flat surface, with a rim surrounding it like the staves of a tub, and rising vertically from it to the height of six inches. This grinding wheel is to be of cast-iron, and it is made to revolve horizontally by means of a vertical shaft attached to its under side. The upper surface must be perfectly flat, and it is to be one-third more in diameter than the thing to be ground; thus a three foot table top would require a wheel four feet six inches in diameter. Around the wheel, within the rim, there is to be a groove, or gutter, six inches wide, and two deep. When articles of other forms, or sizes, are to be ground, they must be fixed within a circular iron rim of the proper diameter. The wheel receives a circular motion by means of a whirl and band; it is to have sand and water within it, and the article to be ground is placed loosely on it.

To prevent the table top, &c. from being carried round by the wheel, and to give it the requisite revolving motion around its own centre, there are two pulleys which descend from above, within the rim of the wheel, and revolve on axles attached to suitable frame work. One of these pulleys is to stand nearly in contact with the rim of the wheel, is to be about one-twelfth of its diameter, and is to be driven by a band with a speed equal to about three-fourths of that of the rim. The other pulley is to be about one-fourth of the diameter of the wheel, and is turned by the motion of the article to be ground, which is brought up against these two pulleys by the motion of the tub wheel.

"The motion of the pulley, driven as aforesaid, is to be so regulated as to give the table top, &c. the due motion, so as to wear the upper plane surface of the tub wheel equally, and thus, by its own wear, and always keep the plane surface thereof a perfectly level plane."

"The improvements claimed are, the application of a tub wheel

with two regulating pulleys, as hereinbefore described, one of which pulleys being driven by a wheel and a band, thus giving to the marble top, or other thing to be ground, the required rotary motion."

The articles thus ground are to be polished by a similar apparatus, covered with leather, and used with any of the ordinary polishing materials.

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50. For improvements in the *Steam Engine;* Benjamin B. Gates, Ontwa, Cass county, Michigan territory, March 24.

The patentee claims to have invented an improvement in the application of steam as a propelling power; in governing the height of water in steam boilers; and in feeding the boilers. This new application of steam is very old, consisting of a wheel with a hollow shaft, through which steam is to be admitted to the wheel, from the periphery of which it is to be emitted tangentically, and is to drive the wheel by its reaction. The mode of supplying water to a boiler is by a closed cistern, with two tubes connecting it with the inside of the boiler, one of them entering the water, and the other the steam chamber, so that the pressure on the surface of the water in each may be equalized. A third tube from the upper part of the closed cistern enters a cold water reservoir, and by opening and closing the cocks with which the respective tubes are furnished, the supply can be given. This plan has been modified in various ways known to engineers, and that before us, like every other part of the machine, is without the most distant claim to novelty.

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51. For a *Plough;* Nathan Baker, Penn township, Cass county, Michigan territory, March 24.

What is intended to be patented appears to be the curvature of the mould-board, as there are some diagrams referring to this; but there is nothing like a specification, or a claim.

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52. For an improvement in the common *Furnace Stove;* Harvey Hubbard, Berlin, Hartford county, Connecticut, March 25.

This stove is constructed with a view to the increase of the radiating surface, and the patentee says, "What I claim as my improvement, and for which I ask a patent, is the addition of the inner cylinder in the upper part of the stove, with openings into said cylinder at the bottom thereof, communicating with the external air in the manner described, and thus increasing the quantity of heat radiated from the upper part of the stove, and, at the same time, generating heated air in the body of the stove, and diffusing it through the adjoining space in a convenient and economical manner. I claim no other part or parts than those above described, and I do not claim to radiate heat, or generate heated air, in one or more cylinders separated from the body of the stove, as is done in Olmsted's patent stoves."

53. For an improvement in the *Rail-road Car;* John Withers, Bart township, Lancaster county, Pennsylvania, March 25.

This is a repetition of what has been repeatedly proposed, and not unfrequently carried into operation, and afterwards abandoned. Three friction wheels are to be placed so as to sustain each end of the wheel axle, one above, and two on each side, forming the bearings of said axles. It is a little remarkable that a thing so old should again be brought forward; the history of abortive projects, however, is unwritten, and, were it published, but few inventors, we apprehend, would consult it, from a fear that they might meet with unwelcome intelligence.

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54. For improvements in *Rail-road Cars;* James Herron, Civil Engineer, Richmond, Henrico county, Virginia, March 25.

There are several distinct improvements claimed by this patentee, all of which are described in a very full and clear manner, and illustrated by drawings, which leave nothing to desire on this point; it will appear, however, upon examining into the originality of the things claimed, that they are generally old, and have been fully described in this journal, or elsewhere in public works. The following are the claims.

"*Specification 1st.*—In this I claim as being the original inventor of carriages adapted to run alike on the edge railway, and on turnpike roads, as hereinbefore described.

"*Specification 2nd.*—In this I claim as being the original inventor of the *roller flanches* for retaining and guiding carriages on rail-roads, as hereinbefore described.

"*Specification 3rd.*—In this I claim as being the original inventor of the plans hereinbefore described for making the carriages conform to the curves on the railway.

"*Specification 4th.*—In this I claim as being the original inventor of the *friction head*, for reducing the friction of axles, as hereinbefore described.

"*Specification 5th.*—In this I claim as being the original inventor of the *friction band*, for reducing the friction of axles, as hereinbefore described.

"And I distinctly claim the right to apply my improvements, or inventions, herein specified and described, in whole or in part, as the nature of the case may require, to all carriages, cars, wagons, locomotive engines, and other machines."

The thing claimed in the first specification, which is for adapting the wheels to run on common roads, was the subject of a patent obtained by Samuel T. Jones, of Philadelphia, on the 22d of February, 1830; see vol. v., page 151; and also of one obtained by Mr. John Pollock, on the first of October of the same year. The present patentee uses wheels of five feet in diameter, with a flat tread, and without the usual flanch, instead of which "there is placed alongside of each wheel a flat disk of iron, which I term a *roller flanch*, as it is at liberty to revolve on its own axis, entirely independent of the

burthen wheel;" "when the carriages are used for streets, the roller flanches are raised up to the position represented by the dotted circle." Mr. Jones, in his specification, above referred to, says, "I sometimes make my wheels without flanches, and, instead thereof, use friction rollers, fixed upon, or adapted to, suitable arms, or bearings, extending down to the rail, so that the rollers may bear against its side, and perform the office of a flanch." "I construct them so that they may slide up, when the car, or carriage, is about to pass off the rail-road."

The plans claimed for making the carriages conform to the curvature of the railway are two, both of which require that the axles of the fore and the hind wheels should have their bearings on separate rectangular frames, which allow the axles to move from their parallel position, like those of common carriages, by means of the hounds; but in the case before us both frames turn, they being "connected by means of a coupling bar at a point intermediate between the axles, to which bars are attached toothed segments, adapting each pair of wheels equally to the curvature of the road."

By turning to vol. iii., p. 66, it will be seen that the late Dr. Wm. Howard obtained a patent, dated November 22d, 1828, for the application of this principle, which he states in the following words: "The connexion of the two beds of the axles at a point equidistant from each; and in the same manner the connexion between the hind bed of one wagon, and the fore bed of that following it, or the fore bed of the leading wagon with any system of guide wheels, so that the wheels not only of one wagon, but of a train, will follow one another in the same curve, without more lateral friction than when on a straight line." This description is accompanied with plates, to which the reader may turn, and see a full exemplification of the principle.

Under this same head, Mr. Herron refers to a method of using jointed crossbars, instead of the circular segments, by which "the same object will be more simply effected." By turning to the patent of Mr. John Pollock, obtained October 1st, 1830, this coupling by jointed crossbars will be found represented in a drawing, together with several other things which the present patentee deems to be new, and among them the making the wheels without flanches, that they may run upon common roads; see vol. vii., p. 17.

The "friction bands," mentioned by the patentee as claimed under his fourth specification, are hoops, or rings, of iron, by means of which the carriage frames are suspended below the axles of the burthen wheels; these hoops pass over the prolonged ends of the axles, and under friction rollers upon the frame of the carriage, and are to roll around by the friction of the axle upon them, in the manner, though not for the purpose, of Winan's friction wheels. It will be found in practice that these hoops will frequently stand still, and allow the axle to turn within them, as has often been the case with Winan's wheels, which have in several instances been cut through by this means. Besides this, the idea of suspending the load upon revolving rings is not new; N. Finlay, of Baltimore, suspended the load in this

way; see the notice of his patent, dated October 27th, 1829, at p. 36, vol. v.

The cranked axle mentioned in the fifth specification is intended to allow the load to extend below the axis of the load wheels. This has been effected by Samuel T. Jones, in a car patented by him, and described, volume v., page 149; it has also been effected by others. We could have cited other authorities, also, in most of the cases above noticed, with some of which we opine that it would be well for civil engineers to make themselves acquainted.

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55. For the *Preparation of Chewing Tobacco;* Edward Chassaing, city of Baltimore, March 25.

The tobacco manufactured by the patent process is denominated "*Natural Roanoke Leaf*," and it is thus prepared; 250 lb. of the best Virginia tobacco is to be sprigged in the usual manner, and sprinkled with a mixture made by boiling 3 lbs. liquorice, 2½ lbs. prunes, 1 lb. figs, 1½ lb. table salt, ⅔ gall. Jamaica rum, and 4 galls. water. The liquid is to be strained, and water enough added to make the liquid amount to four gallons. The tobacco is then to be lightly pressed, as discoloration would be produced by heavy pressure.

The claim is to "the manufacture of chewing tobacco in the manner hereinbefore described."

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56. For *Swivel Blinds for Doors and Windows;* Seril Steere, Gloucester, Providence county, Rhode Island, March 25.

The slats of blinds, it is said, are usually turned by a rod on their inside, each slat being fastened to the rod by a snipe bill. The mode adopted by the patentee is to have a rod at the side of the frame, passing up the ends of the slats, and a pin from this rod to pass into each slat, close to one edge, so that, by raising or lowering it, the slats will swivel on the pivots of each wheel pin which enters the frame. If the patentee had been much of a traveller, we think that he would not have applied for this patent; this mode of fixing blinds is common at the city of Washington.

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57. For a mode of *Applying the Pendulum Power to Propelling Machinery;* Abraham Wade, South Eagle, Allegany county, New York, March 25.

That is, in other words, the applying of nothing to do something, and reversing the maxim, that from nothing, nothing comes. The specification of this imaginary invention occupies six closely written pages of foolscap, but we are disposed to dismiss the whole affair in about double the number of lines; and if estimated by its merits, even these would be more than its share. Four heavy weights are represented as suspended to rods, and from these palls take into ratchet wheels to propel the main driving wheel, which in its turn is to drive any machinery. The directions for building the machine are as absurd as the plan itself; thus, for example, we are told that the "pendulum rod is to be twelve feet and fifteen-sixteenths of an inch in length," and that the rods are "to be connected together by a piece

of timber five feet one inch and seven-thirteenths of an inch in length." It is "to be kept in motion by human strength, horse, water, or other power," and most assuredly it will need it.

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58. For a *Leather Finisher;* Cuchman Bassett, Boston, Massachusetts, March 25.

The machinery described is to be applied to the "finishing of morocco and kid skins; breaking goat and other skins; softening and graining, commonly called boarding, skins; also for working all kinds of hides used in curried leather, and finishing the same." The description is not drawn up by one acquainted with machinery, and the drawing is a mere outline, but imperfectly representing the apparatus. The intention of the machine, however, is to give a vibratory motion to a shaft, in the end of which there is placed a brush, roller, slicker, grainer, or other instrument, which is to be passed over the leather. There is no claim made, and as there are patents for the same purpose, in which machinery very similar to that intended to be described is employed, we dismiss the affair until more light is thrown upon it.

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59. For an improvement in *Saw Mill Dogs;* Martin Rich, Caroline, Tompkins county, New York, March 25.

Mr. Rich had, previously to this date, obtained at least four patents for sawmill dogs, and we see by the list that a fifth is to follow in a day or two; we hope that the breed is sufficiently in demand to pay something more than the expenses of accouchement. The racks, pinions, teeth, levers, and other appurtenances, which are combined together to effect the purposes intended, can be understood only by the drawing, which we do not think it necessary to give.

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60. For a *Plough;* William Hess, Lower Saucon, Northampton county, Pennsylvania, March 27.

"The improvement for which the patent is asked consists in, 1st. The flanch on the mouldboard behind the share, to prevent that part of the plough cutting in the furrow, and thus running heavy. 2d. The running the landplate back to the plough handle, and attaching it to the handle, and extending the cutter back to the handle, by which the plough is strengthened, and the earth will not fall over the landplate into the furrow. 3d. In extending the land side of the share back to the plough handle, and attaching it to the land plate near such handle, by which the plough runs lighter, and there is less trouble in working from the whole of the land side to the share being in one piece." There are no references to the drawing.

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61. For a *Machine for Extracting Hair from Skins;* S. G. Ladd, assignee of S. Graham, Farmington, Kennebec county, Maine, March 27.

This machine is furnished with several rollers, between which the skin is to pass, in order to its being presented to a revolving knife,

by which the hair is to be cut off. The claim is to "the application of the revolving knife, the elastic and other rollers, to this purpose, as well as the general arrangement of the several parts of the machinery, and their application to effect the purpose designed, as specified and described." If memory serves us correctly, the terms of this claim are too broad and general, as we believe that skins have been passed between rollers, and the hair separated from them, by revolving knives, prior to the obtaining of this patent.

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62. For an improvement in the *Construction of Saw Mills;* Nathaniel Crosby, and Pearson Crosby, Pomfret, Chautauque county, New York, March 27.

The only thing claimed in this patent is the application of a balance wheel, or weight, on the crank shaft of a saw mill, as a counterpoise for the weight of the crank, pitman, and saw-gate, and thereby to equalize the motion.

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63. For a *Washing Machine;* Ezra Whitman, Jr., assignee of Ezra Whitman, Winthrop, Kennebec county, Maine, March 27.

This washing machine consists of a round tub, which has a vertical shaft in its centre, to this shaft dashers are attached, which are formed of round pieces of wood, and extend nearly to the inner periphery of the tub; there are also fixed dashers, of a similar construction, fastened to the inside of the tub, and extending nearly to the shaft; the suds and clothes are put into this tub, and the shaft made to vibrate backwards by means of a lever, thus squeezing the clothes between the dashers. Churning, it is said, may also be performed by this machine. The claim is to "the arrangement of the dashers, and the mode of putting them in motion."

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64. For a *Machine to Propel Cradles and Churns;* Ezra Whitman, Jr., Winthrop, Kennebec county, Maine, March 27.

The cradle, or churn, is merely made the pendulum part of an ordinary escapement, operated upon by a weight, the movement being contained in a suitable case. Hundreds have conceived the same project, and several have been wise enough to obtain letters patent for it, which is usually the last we hear of it in each individual case; but, after a time, it is again hatched in some broody brain, and again forgotten.

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65. For an *Inking Machine,* for the hand printing press; Samuel Fairlamb, and John L. Gilpin, city of New York, March 27.

This apparatus resembles, very closely, some of those which we have previously noticed, as intended for the same purpose. The claim made is to "the *manner* of applying an *elastic* scraper to effect the regulation of the printing ink; and the *manner* of applying gravitating substances, or heavy bodies, to propel inking rollers over a

form of type." Thus limited, we see nothing adverse to the sustaining of the claim; but there does not appear to us to be any improvement in the general construction of the machinery, calculated to remove the objections which, after a fair trial, printers have urged against it. It is more subject to be out of order than a roller boy, and is not so easily replaced; it does not work so equally as a good boy, and when it works badly, it is of no use to beat it. These observations apply, not specially to the particular machine before us, but generally to all of a similar kind which have been brought into use.

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66. For an improvement in the *Flat, or Sad, Iron;* William Wilson, Greenfield, Franklin county, Massachusetts, March 27.

Instead of using a wrought-iron handle laid in the flask, and embraced by the cast-iron, a dovetail groove, or mortise, is cast on the upper part of the iron, and a cast-iron handle, with a part corresponding to the dovetail groove, is made to slide into it.

"What is claimed as a patent, is the manner of affixing the handle to the flat, or sad, iron, by means of the tenon and mortise, in form of a dovetail, in manner before described; and the making of the handle of cast-iron separate from the sad iron, and having the tenon joined to it as aforesaid, and cast at the same time with the handle."

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67. For *Saw Mill Dogs;* Martin Rich, Caroline, Tompkins county, New York, March 27.

These are called gauge dogs, as they are intended to regulate the thickness of the stuff to be sawed, which they do by means of screws moving the log on the head and tail blocks. They are so constructed that, if desired, the log can be cut completely through, leaving no stub-shot. There is no claim made, and as gauge dogs have been previously constructed, and operated upon by means of screws, it would have been proper for the patentee to have pointed out the specific difference between the present and former plans; the law, indeed, requires that this should be done.

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68. For the *Manufacture of Metallic, or Steel, Pens;* Peregrine Williamson, city of New York, March 30.

The claims made to this improved pen are several.

"1st. So to unite and combine the nib and holder, as to form a pen producing all the effect of the celebrated pen invented by me in 1809, which had three slits, by so arranging and applying a nib, having one slit, that the three slits, with their full effect, necessarily result from the combination.

"2nd. The graduating slide, which adjusts and regulates, with the utmost nicety, the greater or less flexibility of the pen.

"3d. The application of the metallic regulator, or adjusting slide, to every form or description of pens to which the principle is, or can be, applied.

"4th. The application of the fountain to the holder, instead of applying it to each nib separately, and which application can only be upon my present plan of blending the nib and holder in such a manner as to form together a complete and perfect pen.

"5th. The mode of tempering the nib so as to preserve the extreme points hard, and the increased substance at the points, which both give additional durability to the instrument, and render its action on the paper smooth.

"6th. The mode of compressing or upsetting the points, so as to give to the pen the increased substance at the point."

The mode of tempering alluded to is the inserting the extreme point of the nib in a small hole in a mass of cold metal; the nib then being held over a lamp is blued, whilst the points remain perfectly hard. The points are to be thickened by leaving the nibs sufficiently wide to be upset in a press, so as to double the thickness at the point.

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69. For an *Inflating Pump;* Charles Goodyear, city of Philadelphia, March 30.

This instrument is misnamed in being called a pump, as it is merely a tube, with a piston and valve of a particular construction, intended to be used in inflating life preservers, pillows, mattresses, and other air tight articles, which it is wished to fill with air by means of the mouth, or a pair of bellows. When the mouth, or bellows, is applied to the tube through which the air is to pass, the finger is used to force down a small piston rod, which opens a valve, and makes a free communication with the article to be inflated. The particular construction of the instrument it is scarcely necessary to describe; we think it more complex than necessary, and see no reason why a simple tube, covered with a strip of bladder, or oiled silk, in the manner of the air pump valve, should not answer the whole intention equally well.

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70. For an improvement in the *Horse Power, and in its Application to Thrashing Machines;* Christian Custer, and Daniel Pennypacker, Upper Providence, Montgomery county, Pennsylvania, March 30.

"Those parts of the machine which the petitioners claim as having been invented by them, are, *first*, The wooden floor where the horses walk. *Second.* The application of the small wheels over which the floor passes, and the arrangement of the gearing, with the mode of applying it to the machine. *Third.* The small wheels. *Fourth.* The advantages of the inclined plane. *Fifth.* The machine not being limited in its horse power."

Where five claims are made, one is justified in looking for some novelty, but we have not found it, nor have we seen any thing to induce us to look for it again. The horses are to walk upon an inclined endless floor, exactly like numerous others; its exact length and width are given, and if the horse power is unlimited, it must be by piling them upon each other. In describing the gearing by wheels

and pinions, their precise diameters are prescribed, and most probably there is not another horse power exactly like it in this particular.

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71. For a machine for *Hulling Cotton and Rice;* Jirah Kellog, New Hanover county, North Carolina, March 30.

The claim made in this patent is to "the construction of the rasping wheel and plates; their use and method of application to hulling cotton seed." The rasping wheel is a cylinder covered with hard metallic points, between which and the plates, similarly armed, the seed is to be hulled, being fed between the two by a hopper. The hulling plates are similar to, and take the place of, the concave in many thrashing machines.

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72. For a Power Augmenting Engine; Andrew Ochler, Eastville, Northampton county, Virginia, March 30.

This machine belongs to the class of incomprehensibles, as might well be supposed from its title; and although, in examining such machines, the idea which exists in the mind of the inventor can generally be perceived, although it may be destitute of rationality, we are not, in the present instance, quite sure that we can do even this. It seems, however, that there are to be two inclined planes on the platform of a carriage, and that by means of a lever worked like a pump handle, a roller is to be made alternately to ascend and descend these inclined planes, and that power is to be thus obtained to drive a locomotive, move a house about upon wheels, work a saw, and do many other things where power is required. We have more than once believed that we had witnessed the capping of the climax of absurdity in imaginary mechanical inventions, but we have as frequently been rebuked for entertaining such an opinion, and never more forcibly than in the present instance.

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73. For a *Thrashing Machine;* William W. Ross, Chillisquaque, Northumberland county, Pennsylvania, March 30.

Although this is called a patent for a thrashing machine, there is no attempt whatever to claim any part of this apparatus, which is well enough, as there is not any thing in it which could rightfully be claimed. The description is devoted quite as much to a horse power, not mentioned in the title, by which the thrashing machine is to be driven, and the claim refers to this only, being in the following words: "What I claim as my peculiar invention, is the mode in which the driving power is applied by the before described cones and chill boxes. I also claim the method of reversing the motion of the machine, when the teeth are worn out on one side."

The denominations of cone, and chill boxes, are entirely misapplied, and refer to wheels and pinions on the horse power—no part of the patent.

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74. For apparatus for *Closing Doors, Gates, &c.;* Oliver Davidson, Ballston Spa, Saratoga county, New York, March 30.

A roller, fixed to the casement or framing of the door, is to bear against it; the roller is attached to a compound lever, working on a rule joint. The patentee says that "The application of power by this mechanical contrivance, for the purpose within specified, is new, and I claim to be the inventor."

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75. For *Galvanic Apparatus, applied to Cavities of the Human System;* Daniel Harrington, city of Philadelphia, March 31.

This patent is obtained for some new modifications of the galvanic apparatus, applied to the cure of diseases, several of which have been previously patented by the same gentleman. As the principle of action does not vary essentially from some of which we have given specifications, we deem it unnecessary to give a particular description of these new forms of the instruments employed.

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a Patent for an improvement in the Mode of Sustaining the Weight, and Applying the Power, in Wheeled Carriages. Granted to SAMUEL CHAPMAN, Jr., *Windsor, Berkshire county, Massachusetts, March 2nd,* 1835.

To all whom it may concern, be it known, that I, Samuel Chapman, Jr., of Windsor, in the county of Berkshire, and State of Massachusetts, have invented an improvement in the mode of sustaining the weight, and applying the power, in wheeled carriages. And I do hereby declare that the following is a full and exact description thereof.

My invention is applicable either to carriages upon common roads, or upon rail-roads; and also to those with two, or with four wheels, and consists in suspending the load so that it shall act against, and be sustained by, the peripheries of wheels upon the same axes to which the road wheels are attached, or, when the invention is applied to rail-roads, upon the peripheries of the road wheels themselves.

In constructing rail-road cars upon the principle adopted by me, the wheels are to be made, and placed upon axles, in the usual way; one or both of these wheels, however, may be left free to revolve upon the axle, to allow of a more free motion upon curves than when both wheels are firmly fixed. The axles themselves are not to be attached in any way to the car, no boxes, or bearings, such as are ordinarily employed, being required, or admissible; the whole connexion between the car and the road wheels being made through the intervention of large friction, or *driving*, wheels, to be presently described.

To a frame which is to sustain the body of the car, or carriage, I attach friction, or *driving*, wheels, a pair to each car wheel, in such a situation that their peripheries may rest upon the periphery, or tread, of the car or road wheel, at about ninety degrees from each

other, and equidistant, or nearly so, from the apex of the car wheel. The faces of these friction, or driving, wheels, are to be adapted to those of the car wheels, and they may, if found necessary, be furnished with flanches similar to them, and embracing their unflanched sides. It is manifest that, in a car thus constructed, the whole weight thereof, with its load, will rest upon the upper part of the peripheries of the road wheels, their axles serving no other purpose than to keep each pair of wheels in their proper positions, as related to each other.

In applying the same principles to carriages on common roads, it will not be proper to allow the faces of the friction, or driving, wheels, to run in contact with the road wheels; but in this case I fix secondary wheels upon the same hubs with the road wheels, and, usually, at a small distance within them. These secondary wheels must be so much smaller in diameter than the road wheels, as may be necessary to keep them free from the dirt and obstructions upon the road. They have, in general, flanches rising from each of their sides, above their faces, so as to form a groove, to receive, and check the lateral motion of, the friction, or driving, wheels, which are to rest upon them; they revolve on gudgeons affixed to the frame work of the carriage, and transferring the bearing of the load on to the peripheries of these secondary wheels, which being firmly fixed on the same hubs on which the road wheels are placed, produce the same effect as though they actually rested upon the road wheels, abating the difference in their diameters.

In a four wheeled carriage, which must be made capable of turning abrupt curves, the frame work which sustains the friction or driving wheels of the fore and the hind wheels must be detached from each other, allowing them to play upon a perch in the common manner, or in any other which will admit of the same effect being produced.

In order to keep the wheels in their places upon common roads, where they are liable to sudden jolts, I place two smaller friction wheels upon the frame work of the carriage, at situations diametrically opposite, or nearly so, to the friction, or driving, wheels. These friction wheels need not be more than five or six inches in diameter, as, although they are near to, they do not actually touch, the faces of the secondary wheels, unless they are brought into contact to check the tendency of the upper, or driving, wheels, to move out of their places in consequence of the road wheels meeting with obstructions, against which they strike.

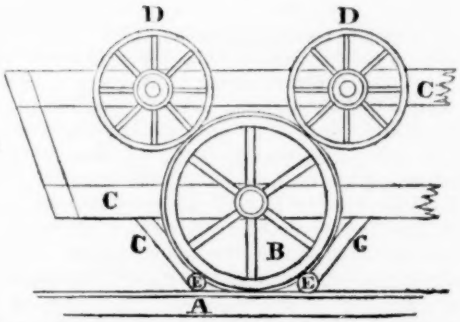
I have thus fully exemplified the principle upon which I intend to construct cars, or carriages, either upon rail, or common, roads; and it is my design, also, to apply the same to locomotives; but in doing this, the driving, or friction wheels, and also the secondary wheels, are to be furnished with teeth, or cogs, upon their peripheries, so that the action of the engine may cause them to slip round upon each other. These secondary wheels may be cast, and made one with the road wheels.

What I claim as my invention, and for which I ask letters patent,

is the sustaining of, and applying the power to, cars, carriages, or locomotives, upon the peripheries of road, or secondary wheels, upon the principle, and in the manner, herein set forth; not intending, however, to confine myself to the precise arrangement of the several parts as set forth, but to vary the same in any way which I may find convenient, whilst I attain similar ends by means substantially the same.

SAMUEL CHAPMAN, Jr.

A, rail.
B, car wheel.
C C, frame of the carriage.
D, driving wheels.
E, friction wheels.



Remarks by the Editor.—We have not published the foregoing specification from a conviction of the utility of the thing patented, as, on the contrary, we are aware that the patentee is entirely erroneous in his views; of this opinion he was aware at the time of obtaining his patent; but, like some other intelligent men, he appeared to labour under a temporary hallucination, a certain cure for which, however, would be found in the attempt to put the thing into practical operation; whether or not this has been done, we have not heard; the news of its success, we presume, would have reached us.

Specification of a Patent for an improvement in the method of Casting Chilled Iron Rollers. Granted to JAMES HARLEY, *city of Pittsburgh, Pennsylvania, March 2nd,* 1835.

To all to whom these presents shall come, be it known, that I, James Harley, of Pittsburgh, in the county of Alleghany, and state of Pennsylvania, have invented a new and useful improvement in the "mode of casting chilled rollers, and other metallic cylinders and cones," and that the following is a full and exact description of the construction and operation of said machine, or improvement, as invented or improved by me.

In order to show the object of my improvement, I state the usual method as now practised in casting chilled rollers, as follows. The mould in which they are cast consists of a main central portion, formed by a hollow metallic cylinder; and the two ends, called journals, and couplings, which are moulded in sand.

Now, if the metal be poured into such a mould in the usual manner that is, through a tube descending to its lower extremity, the motion thus communicated to it, as it rises in the mould, tends to throw all the sand, dross, slag, &c., towards the external part of the roller, and thereby occasions cracks, flaws, and other imperfections on its surface; therefore, in order to obviate this injurious tendency, it is the custom to stir the fluid metal with a rod, so as to give it a rotary motion, in order, by this stirring, to bring the light substances to the centre. But this operation of stirring is dangerous, and does not effect its object with certainty.

My method of construction is, to insert a pipe, or pipes, (which may be called gates,) at openings into, or near, the bottom of the main chill cylinder, or near the inner surface of the said cylinder; and the line of direction of said pipes, or gates, is not to be that of a perpendicular to said bottom, or inner surface, but that of an oblique, or slanting line, usually equal to about thirty degrees, that is, approaching the direction of a tangent to the cylinder. Beneath these openings, by which the pipes enter the main chill cylinders, is to be formed a circular chamber, with as many openings as there are pipes to communicate with the openings into the cylinder, and the pipes are to connect this chamber with the cylinder in the oblique, or slanting, direction above described; it is also advantageous to have this circular chamber closed by a partition across it, on one side of the opening in the circumference, left for the insertion of the descending tube, by which the fluid metal is to be poured in.

This is the construction of my improvement; the manner of using it is as follows. The melted metal is poured in at the descending tube, by which it arrives at the opening at the bottom of this tube leading into the circular chamber; here the metal enters, and on one side being arrested by the partition closing the chamber at the side of this opening, the stream, or course, of the metal will be driven to the other, and, consequently, continued round. The partition is to be so placed as to give the course of the stream in the same direction round as that to which the pipes, or gates, lean.

The metal flowing up these inclined tubes or pipes, acquires a rotary motion on entering the main cylinder, which is the object I wish to attain, thereby preventing the necessity of stirring with a rod; and this rotary motion is necessary, in order to bring the light substances to the centre, and throw the heaviest and best metal to the circumference.

What I claim as my own invention, and not before or previously known, in the above described machine, or improvement, is, that the tube, or tubes, or passages, called gates, through which the metal is to be conveyed into the mould, shall not enter the mould perpendicularly at the bottom, but slanting, or in a direction approaching to a tangent of the cylinder; or if the gates enter the mould horizontally, or nearly so, that they shall not enter in the direction of the axis of the cylinder, but in a tangent from, or inclining towards a tangent of the cylinder.

JAMES HARLEY.

Specification of a Patent for dressing the faces of Metallic Mills. Granted to SAMUEL G. REYNOLDS, *Providence, Rhode Island, March 18th*, 1835.

To all whom it may concern, be it known, that I, Samuel G. Reynolds, of Providence, in the county of Providence, and state of Rhode Island, have invented an improvement in the mode of facing, furrowing, picking, or dressing, the disks, or disk-like faces, of metallic mills, by means of which improvement such mills are rendered much more efficient than any of those heretofore constructed; which mill, so improved, I denominate the File mill. And I do hereby declare that the following is a full and exact description thereof.

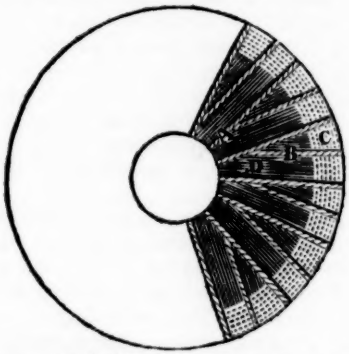
I make the grinding part of my mill, in general, round, and flat, like the stones of the common grist mill. The surfaces of the two disks may be each of them flat, or rather slightly concave; or one of them may be, to a certain degree, conical, or convex, the other being adapted thereto so as to bear the same relationship to it, as the two flat, or nearly flat, disks do to each other, in which case their operation will be substantially the same. One of these disks is to be a runner, and the other is to be stationary; or if three disks are used, the middle one is a runner, whilst the other two are stationary. As neither the position, the number of disks employed, nor the variations in the flatness of their surfaces, above alluded to, makes any difference whatever in the principle of action, I shall confine myself, for the purpose of description, to a mill consisting of two disks, placed horizontally; and more particularly to the manner in which the disks are dressed and furrowed.

The disks may be made of iron, or steel, and may be either hardened, or left soft; I prefer, however, to make them of wrought iron, and to leave them soft, as I have proved by experiment that they will run for a very considerable length of time without requiring to be sharpened, or picked, and that when they do require it, that it may be done with very little labour; whilst, when hardened, the labour and risk of softening, sharpening, and rehardening them, are very considerable.

The disks which I employ are rarely made to exceed fourteen inches in diameter; twelve inches I deem a medium size, and they should be about one inch in thickness. The manner of dressing and furrowing them is represented in the cut. I usually make in them about sixteen furrows, A, leading from the eye to the periphery, and an equal number of branch furrows, B, all having a direction similar to those in the stones of ordinary grist mills. The direction of the bevil of these furrows, and the cutting upon them, to be presently described, constitute an important feature of my invention.

I make the furrows about one-fourth of an inch in depth, and shape them so that the bevil of those on the runner disk is on that side of each furrow which is opposite to the motion; whilst those on the bed, or stationary disk, are in the reverse direction. The intention of this

is to cause the grain to glide over, and rise easily up the bevils on to the lands, instead of being thrown too quickly out by the centrifugal force consequent upon the very rapid motion of the runner. Notwithstanding this provision, however, the too rapid discharge of the grain would take place, were it not for another provision to be now described. It will be seen in the drawing, that the furrows are represented with hatched lines crossing them obliquely; these are intended to show the float teeth, bars, or grooves, contained in the furrows, to obstruct the passage of the grain, and to cause it to rise up the bevils, or inclined planes, of the furrows, with the greater certainty. What I esteem the best way of forming these, is to take a cold chisel, and to cut float teeth from the deepest point of the furrows, inclining towards the periphery, at an angle with the furrow of about forty-five degrees. The chisel is to be so held that the edges of these teeth may incline towards the centre of the disk. It is manifest that the purpose for which these are cut, namely, the partial obstruction of the course of the grain outwards, and the directing it up on the lands, may be attained by variations of this provision, but the principle and design are sufficiently apparent.



The lands I cut up file fashion, the fineness or coarseness of the cutting depending upon the nature of the material to be ground; that portion extending from the eye to within one or two inches of the periphery, I cut in the form of long float teeth, D, running in a direction parallel with that of the branch furrows; the edges of these teeth are inclined with the motion of the runner, or so as to produce a direct cutting effect; those on the bed plate being, of course, reversed. The remaining portion, C, I cut rasp fashion, taking a sharp pointed punch, (a prick punch I have found to answer the purpose,) and holding it with such an inclination as shall give to the teeth formed thereby, the same direction with the float teeth. To a mill of this description I give, in order to the production of its full effect, about two thousand revolutions in a minute.

I do not claim to be the inventor of mills for grinding by means of metallic disks, furnished with grooves and furrows, these having been previously known and used; but what I do claim, and wish to secure

by letters patent, is the manner of obstructing the passage of the grain along the furrows, and directing it up the bevil on to the lands, by means of the float teeth, or other analogous obstruction made therein, for the purpose, and upon the principle, herein described. I also claim the combining together the different modes of dressing the faces of the disks, so as to form the cutting or grinding surfaces as herein described.

SAMUEL G. REYNOLDS.

Remarks by the Editor.—We have not heard any thing respecting this mill since the date of the patent, but at that period one of them was brought to Washington, and put into operation in the neighbourhood; we did not see it at work, but persons who did, and who are well acquainted with the manufacturing of meal, were surprised at the goodness and the quantity of the work performed by it, and were induced to speak highly of its merits, although much prejudiced against it previously to witnessing its operation. The disks, we think, did not exceed nine inches in diameter.

Specification of a Patent for an improved mode of making, or preparing, the Pannels for Coaches, and other Wheeled Carriages. Granted to EBENEZER A. LESTER, *Machinist, Boston, Massachusetts, March 18th,* 1835.

To all whom it may concern, be it known, that I, Ebenezer A. Lester, of the city of Boston, in the State of Massachusetts, have invented a new and improved mode of making, or preparing, the pannels for coaches, and other wheeled carriages, or vehicles, in which pannels are employed. And I do hereby declare that the following is a full and exact description of my said invention, or improvement.

My improvement consists in making the pannels of metal, instead of wood; and for this purpose I prefer to use sheet iron, as combining lightness and strength, whilst it is less costly than most of the other metals. Sheets of zinc, copper, or other metal, or metallic alloy, may also be used. The frame for the insertion of the pannel may be grooved in the usual manner, and the pannel, properly raised and formed, inserted in these grooves when the frame is put together; the pannels are then to be painted and finished. I intend sometimes to finish such pannels by japanning them, as tea trays and other articles are japanned; and in this case it will be best, instead of grooving the frames, to form rebates therein, so that when the body of the carriage, or other vehicle, has been completely painted and varnished, the pannels can be put into the frames from within, and secured there by means of strips of wood, or metal, or in any other manner which may be found convenient. As, from the motion of a carriage, the pannels are subjected to a degree of friction which might remove the painting, or japanning, so that the edges of the metal would rust, or corrode, by the insinuation of moisture; to prevent this, I intend to insert into the groove, or rebate, some elastic material, such as

India rubber, India rubber cloth, or any other substance which may answer this intention.

I have thus described, in a manner sufficiently full to direct a competent workman, the nature of my said improvement, and the manner in which I intend to carry the same into effect; and I do hereby declare that what I claim as my invention, or improvement, is simply the making of the pannels of coaches, and other wheeled carriages, or vehicles, of metal, instead of wood, no other change being made in the formation of such carriages, excepting such as may be necessary to adapt the frame-work to such pannels.

EBENEZER A. LESTER.

Report to the Directors of the London and Birmingham Railway Company, accompanied by Experiments on the Transverse Strength, &c. of Malleable Iron, with reference to its use for Railway Bars. By PETER BARLOW, *Prof. Royal Mil. Acad., Woolwich.*

(Concluded from p. 199.)

Comparative Strength of differently formed Parallel Rails.

Let A B C D (fig. p. 265) represent any rectangular rail with a bottom table; $n\ n$ its neutral axis; c the centre of compression, $c\ n$ being $\frac{3}{5}$ of $h\ n$. Now, the tension of each fibre being as its distance from the neutral axis, and that of the lower fibre being given equal to t, the tension at any variable distance x will be $\frac{t\,x}{d}$ (d being taken to denote the whole depth $n\ s$,) and therefore the sum of all the tensions will be $\frac{t}{d'}\int x.\,d\,x$ (1) which, therefore, become known, x being taken within its proper limits, according to the figure of the section.

But as the effective resistance of each fibre is also as its depth below the line $n\ n$, the sum of all the resistances will be $\frac{t}{d'}\int x^2.\,dx$ (2) x being taken here also within its proper limits. And then to find the centre of tension, or that point into which, if all the tensions were collected, the whole resistance would be the same as in the actual case, this would be given by the formula, $\frac{\int x^2.\,d\,x}{\int x.\,d\,x}$ (3) which is precisely the expression for the centre of oscillation of a disc of the same figure.

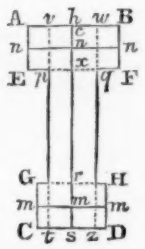
We have hence the following general rule for finding the resistance or the weight which any given bar or rail will support at its middle point, within the limits of its elastic power, that is,

Calling the integral of formula (1) = A
Ditto ditto formula (2) = B
Ditto ditto formula (3) = D
And the distance $c\ n$ = C

then, referring the sum of all the resistances B to the common centre of compression, we have $D : D + C :: B : \frac{B(D+C)}{D}$ which is the whole effect.

For those who understand the integral calculus, this solution is sufficient; but as this article will, probably, be consulted principally by practical men, it will be more convenient to give a specific solution for a rail, embracing under one general figure all the usual forms, the only variations being in the depth, breadth, and thickness, of the parts.

Let A B C D represent such a section, of which all the dimensions are given, as also the position of $n\,n$ the neutral axis, the point c which is the centre of compression, $c\,n$ being two-thirds of $n\,h$, and the point m which is in the centre of $r\,s$. The breadths $n\,n$ and $m\,m$ are also known. Then the resistance of the whole section referred to the common centre of compression c, may be considered to be made up of the three resistances.



1st. Of the middle rib, continued through the head and foot tables, $v\,t\,z\,w$.

2nd. Of the head A E F B, minus the breadth of the centre rib.

3d. Of the lower web, G C D H, also minus the continuation of the centre rib.

Now, t being taken to represent the tension of iron per square inch, just within its limits of elasticity, we shall have:

1. Resistance of $v\,t\,z\,w = \frac{1}{3}\,h\,s\,.\,n\,s\,.\,p\,q\,.\,t$

2. Resistance of A E F B $= \frac{1}{3}\,h\,x\,.\,n\,x\,.\,(n\,n - p\,q)\,\frac{n\,x}{n\,s}\,t$

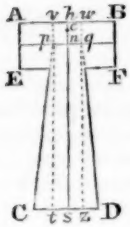
Now, let $n\,m + \frac{r\,s^2}{12\,n\,m} = s'$, and $s' + c\,n = s''$, then

3. Resistance of G C D H $= n\,m\,.\,r\,s\,.\,(m\,m - p\,q)\,\frac{s''}{d'}\,t$

These three resistances being computed, let their sum be called s, and the clear bearing l; then $\frac{4\,s}{l} = w$, the load the bar ought to sustain at its middle point, for an indefinite time, without injury to its elasticity.

Trapezoidal Rail.

Produce the sloping sides till they intersect the neutral axis in p q. Then the rule for the head A E F B, and middle rib, $v\,t\,z\,w$,



will be the same as given above; and for the two sides, $p\,C\,t$, $q\,D\,z$, the formula is,

$$\frac{1}{3}\left(\frac{3}{4}\,n\,s + c\,n\right) \times (C\,D - p\,q)\,n\,s^{*}\,t.$$

The sum of this, with that of the head and middle rib, multiplied by 4, and divided by l, as before, will be the weight required.

Another general and very curious mechanical method of finding the resistance of a railway bar, is also suggested by the remark in p. 264, viz: that the centre of tension is the same as the centre of oscillation of a disk of the form of the section, cut off at its neutral axis, which in words may be given as follows:

Find the centre of oscillation, and the centre of gravity, of the area below the axis, by the usual mechanical methods, and call the distance of the former below the neutral axis o, that of the latter g, the area a, the depth d', and the distance $c\,n = c$, the tension t, and bearing l, as usual, then the weight the bar will support will be,

$$w = 4\frac{(o + c)\,a\,g\,t}{l\,d'}$$

The preceding rules, however, will be generally more convenient, particularly when some of the dimensions become fixed, as necessarily happens in such cases as we are considering. For instance, whatever figure may be given to the transverse section, the head may generally be supposed to occupy two-fifths of it; and, therefore in the larger rails, to have about two inches section, and to be one inch deep, that the lower web, when there is one, is the same depth as the head, and that the neutral line bisect the head, or upper table.† With these as fixed dimensions, the preceding formulæ, page 265, are reduceable to words at length. They apply, however, only to the larger rails; for other cases, it will be best to have recourse to the general rules.

* This includes the small dotted part of the triangular sides in the head and in the sides, but the amount is so very inconsiderably in error, as to be nearly or wholly insensible in the result.

† We have the means of computing the position of the neutral line by the data obtained from the experiments, p. 193, which show that in rectangular bars the area is divided in the ratio of 1 to 4, or the area into the distance of the centre of gravity of the two parts as 1 to 4^2. But in inquiries of this kind, the less we have to depend on theory the better. I have, therefore, deduced the above position from the experiments on actual railway bars, p. 270, by considering the distance $n\,h$ as unknown, and equating the formula in this shape with the mean elastic strength, which is found to be $8\frac{1}{4}$ tons. The equation is, therefore,

$$\frac{1}{3}\left\{5\,(5 - x)\,9 + \frac{11.\,(1 - x)^2}{5 - x}\right\} = \frac{8\frac{1}{4} \times 33}{4}$$

Whence we find $x = .47$, which may be considered as .5, without sensible error.

Resistance of the Head, or Upper Table.

1. Subtract the thickness of the middle rib from 2 inches, and multiply the remainder by 10.

2. Subtract half an inch from the whole depth, and multiply the remainder by 12.

Then the former product, divided by the latter, will be the resistance in tons due to the head, not including the continuation of the middle rib.

Resistance of the Centre Rib.

Multiply the whole depth of the rail by the whole depth, minus half an inch, and that product by 10 times the thickness of the rib; and the last product divided by 3, will be the resistance in tons of the middle rib continued through the whole depth, *i. e.*, through the upper and lower tables."

Resistance of the Lower Web.

1. Multiply the whole depth of the rail, minus 1 inch, by the thickness of the bottom web, minus the thickness of the rib, and that product by 10.

2. From the whole depth of the rail subtract 1 inch, and to 12 times the square of the remainder add 6 times the remainder, and call this the first number. From this subtract twice the remainder, and add 1, and call this the second number. Then say, as the first number is to the second, so is the product obtained in the former part of the rule to the resistance of the lower web, not including the continuation of the middle rib.

Lastly, the sum of these three resistances multiplied by 4, and divided by the clear bearing length, will be the weight the rail will sustain without injury. A few examples, worked at length, are given below, to illustrate the rules.

Examples.

(1) In Mr. Stephenson's rail the greatest depth is 5 inches, with a plain rib, whose thickness is .9 of an inch. Here,

Resistance of Head $\left\{\begin{matrix}(2-.9)\times 10=11)\\(5-\frac{1}{2})\times 12=54)\end{matrix}\right\}\frac{11}{54}=$ 0.20

Ditto of Rib, . $\frac{4\frac{1}{2}\times 5\times .9\times 10}{3}=$ 67.50

67.7

And $\frac{4\times 67.7}{33}=8.21$ tons, the greatest weight.

Deflection with this weight $\frac{.22}{4.5}\times\frac{4^{*}}{3}=.066$

* See pp. 122 and 196.

(2) Parallel rail of the same depth and weight, viz: 50 lbs. per yard. Here the thickness of centre rib = .78. Hence,

		Tons
Resistance of Head	$\left\{\begin{matrix}(2-.78)\times10=12.2\\(5-\frac{1}{2})\times12=54\end{matrix}\right\}\ \frac{12.2}{54}$ =	0.225
Ditto Rib, .	$\frac{4\frac{1}{2}\times5\times.78\times10}{3}$ = . .	58.500
		58.725

And $\frac{4\times58.725}{33}$ = 7.11 tons, the greatest weight.

Deflection with this weight $\frac{.22}{4.5}$ = .048

(3) Parallel rail with bottom web, the depth being still 5 inches, the thickness of the rib .6 of an inch thickness, or breadth of section of lower web 1.32, the weight being 50 lbs.

		Tons
Resistance of Head,	$\left\{\begin{matrix}(2-.6)\times10=14\\(5-\frac{1}{2})\times12=54\end{matrix}\right\}\ \frac{14}{54}$ =	0.26
Ditto of Rib,	$\frac{4\frac{1}{2}\times5\times.6\times10}{3}$ =	45.00
Lower Web,	$\left\{\begin{matrix}(5-1\times.72\times10=28.8\\12(5-1)^2+24=216=1\text{st No.}\\216-7=209=2\text{d No.}\end{matrix}\right\}$	
As 216 : 209 : : 28.8 : 27.94 . . .		27.94
		73.20

And $\frac{73.20\times4}{33}$ = $8\frac{3}{4}$ tons, the greatest weight.

Deflection with this weight $\frac{.22}{4.5}$ = .048.

(4) As another example, let us take a parallel rail of 50 lbs. per yard, depth $4\frac{1}{2}$ inches, thickness of rib $\frac{7}{10}$ths of an inch, and of the bottom web 1.39.

		Tons
Resistance of Head,	$\left\{\begin{matrix}(2-.7)\times10=13\\(4\frac{1}{2}-\frac{1}{2})\times12=48\end{matrix}\right\}\ \frac{13}{48}$ =	0.27
Ditto of Rib,	$\frac{4\times4\frac{1}{2}\times.7\times10}{3}$ =	42.00
Ditto of Lower Web,	$\left\{\begin{matrix}3\frac{1}{2}\times(1.39-.7)\times10=24.15\\12\ (3\frac{1}{2})^2+21=168=1\text{st No.}\\168-6=162=2\text{d No.}\end{matrix}\right\}$	
As 168 : 162 : : 24.15 : 23.28 =		23.28
		65.55

$\frac{4 \times 65\ 55}{33} = 8$ tons, nearly the greatest weight.

Deflections with this weight $\frac{\cdot 22}{4} = 0.55$.

Remarks on the above Results.

It appears from these results, that it is always possible to produce a parallel rail of good practical proportions, which shall be as strong as a fish-bellied rail of the same weight; and this being the case, I am decidedly convinced, after hearing and well weighing every argument that has been advanced in favour of the latter form, that the parallel rail is the best.

First.—Because, although it is not stronger nor stiffer in the middle point than the fish-bellied rail, it is both stronger and stiffer, in a very sensible degree, in every other point.

Second.—The deflection of a parallel rail during the passage of a load, is less every where than in the middle, which is not the case in the fish-bellied rail. The rise and fall of the carriage, therefore, after passing over a support, is more rapid in one case than in the other; and to this, rather than to a want of equable strength throughout, I am disposed to attribute the many failures of fish-bellied rails within a short distance of their point of support. There is, however, or has been hitherto, an actual want of equable strength towards the point of support in rails of this form, which cannot fail to have facilitated these fractures; but which Mr. Stevenson, by a judicious and scientific distribution of the metal, has avoided, and no doubt such fractures would be with his rail less common; but the objection I offer above applies not merely to the fish-bellied rail, but to the truly elliptical form itself, if it were possible to arrive at it.

Thirdly.—The parallel rail is the best, because it enables the engineer to keep the blocks and chairs of the two rails directly opposite to each other, so that the wheels of the carriage shall pass over both supports at the same time,—a point, I believe, not hitherto much attended to, but which is, I conceive, of great importance. There can be no doubt the motion of a locomotive carriage consists of a succession of ascents and descents; and it must be evident how much easier and better the motion would be, to have the opposite wheels both rising and both falling together, than to have one always rising while the other is falling, and the contrary. The difference is similar to that of a vessel keeping her head to the waves, and crossing their direction obliquely. And every one who has never been further than Margate must have experienced this difference.

It may be observed that the waves of the railway, or the deflections of the rails, are very small; but I would observe, also, that the weights and velocities of the carriages are very great, and that it is very desirable every possible cause of momentum should be removed, particularly when it is as easy to do it as not to do it, as is the case with parallel rails, because they can always be cut to determinate lengths, but which cannot be done in the fish-bellied rails, in consequence of the occasional slipping of the bar in the rolls. At all

events, their length cannot be varied at pleasure, which the former will admit of, and which is necessary, in going round sweeps, to preserve the blocks always parallel. For example, in going round a sweep of 800 feet, to keep the supports parallel, the rails of the inner course require to be about an inch shorter than the outer ones, and they are as easily cut into lengths of fourteen feet eleven inches, as of fifteen feet, which is not practicable in the other form.

The above is my decided conviction relative to the longitudinal figure of the rails. I entered upon the inquiry without prejudice; I felt sensible of the honour which the general meeting had done me in confiding the question to my investigation; and I have given to it (after obtaining the requisite data) all the attention necessary to arrive at a certain conclusion.

The following experiments were made on different rails, and the results may be compared with the preceding calculations.

Experiments on the Resistance and Deflection of Railway Bars.

Mr. Stephenson's Fish-bellied Rail, 50 lbs per yard.

Bar No. 1.			Bar No. 2.		
Weights.	Deflections by Index.	Deflections for each ton.	Weights.	Deflections by Index.	Deflections for each ton.
1	.035		1	.014	
2	.045	.010	2	.022	.008
3	.055	.010	3	.030	.008
4	.065	.010	4	.042	.012
5	.071	.006	5	.050	.008
6	.076	.005	6	.062	.012
7	.087	.011	7	.075	.013
7½	.095	.016	8	.085	.010
			9*	.101	.016
			10	* Elasticity injured.	
			11	.300	

Bar No. 3.			Bar No. 4.		
Weights.	Deflections by Index.	Deflections for each ton.	Weights.	Deflections by Index.	Deflections for each ton.
1	.018		1	.045	
2	.025	.007	2	.056	.011
3	.038	.013	3	.065	.009
4	.054	.016	4	.075	.010
5	.062	.008	5	.084	.009
6	.069	.007	6	.095	.011
7	.080	.011	7	.105	.010
8	.094	.014	8	.110	.005
8½	.100	.012	9	.116	.006
9*	.112	.018	10	.125	.009
9½	.118	.018	11	.165	
10	.126	.014			
11	.160	.034			
17	destroyed				

Mean deflection per ton, Bar No. 1, .0097
No. 2, .0101
No. 3, .0110
No. 4, .0090

Mean, .0100

Table Continued.

Bar No. 5, Fish-bellied. Great depth, 5 inch. Less ditto, 3¾. Thickness of rib, 9-10. Head estimated, 2 by 1.			Bar No. 6, Fish-bellied. Great depth, 3¼ inch. Less ditto, 2½. Thickness of rib, 7-10. Head estimated, 2 by ¾.			Bar No. 7, Fish-bellied. Great depth, 3 inch. Less ditto, 2. Thickness of rib, 6-10. Head estimated, 2 by ½.		
Weight in tons.	Deflec'n by Index.	Deflec'n for each ton.	Weight in tons.	Deflec'n by Index.	Deflec'n for each half ton.	Weight in tons.	Deflec'n by Index.	Deflec'n for each half ton.
1	.030		0.5	.120		0.5	.033	
2	.260		1.0	.140	.020	1.0	.060 Readje'd	.027
3	.270	.010	1.5	.170	.030	1.5	.062	
4	.290	.020	2.0	.180	.010	2.0	.090	.028
5	.300	.010	2.5	.200	.020	2.5	.120	.030
6	.320	.020	3.0	.230	.030	3.0	.155	.035
7	.335	.015	3.5	.280	.050	3.5	.240	
8	.410	.060	4.0	.420	.140	4.0		
Mean deflection per ton to 7 tons,		.015	Mean deflection per half ton to 3 tons,		.022	Mean deflection per half ton to 2 tons,		.030
Ditto with 7½ tons,		.107	Ditto with 3 tons,		.066	Ditto with 2 tons,		.060

Comparison of the above Results with the Formulæ, page 265, viz:

$$\text{Rib, } \frac{1}{3}\, h s \,.\, n s \,.\, p q \,.\, t$$

$$\text{Head, } \frac{1}{3}\, h x \,.\, \overline{\overline{n x^2}}\, \frac{n n - p q}{n s}\, t$$

Bar No. 5.

Here, $\begin{cases} hs = 5, ns = 4.5, pq = .9, t = 10 \\ hx = 1, nx = .5, nn - pq = 1.1 \end{cases}$

Hence, $\frac{1}{3} \times 5 \times 4.5 \times 9 = 67.5$

$$\frac{1}{3} \times 1 \times \overline{\overline{0.5^2}} \times \frac{11}{45} = .20$$

$$\frac{67.7 \times 4}{33} = 8\tfrac{2}{11} \text{ tons}$$

$$\frac{.22}{4.5} \times \frac{4}{3} = .066, \text{ deflection}$$

Bar No. 6.

Here, $\begin{cases} hs = 3.25, ns = 2.88, pq\ .7, t = 10 \\ hx = .75, nx = .375, nn - pq = 1.3 \end{cases}$

Hence, $\frac{1}{3} \times 3.25 \times 2.88 \times 7 = 21.84$

$$\frac{1}{3} \times .75 \times \overline{.375^3} \times \frac{13}{2.88} = .15$$

$$\overline{21.99} = s$$

$$\frac{4\,s}{33} = 2\tfrac{2}{3} \text{ tons}$$

$$\frac{.22}{2.88} \times \frac{4}{3} = .092, \text{ deflection}$$

Bar No. 7.

Here, $\begin{cases} hs = 3, ns = 2.75, pq = .6, t = 10 \\ hx = .5, nx = .25, nn - pq = 1.4 \end{cases}$

Hence, $\frac{1}{3} \times 3 \times 2.75 \times 6 = 16.50$

$$\frac{1}{3} \times .5 \times \overline{.25^3} \times \frac{14}{275} = \quad .05$$

$$\overline{16.55} =$$

$$\frac{4\,s}{33} = 2.06 \text{ tons}$$

$$\frac{.22}{2.75} \times \frac{4}{3} = .106 \text{ deflection.}$$

Notes and Illustrations.

In order to avoid embarrassing the detail of the experiments with mathematical solutions, I have generally only stated the equations, and their results, in the preceding paper; but as, in its present form, some persons may wish to see the solutions themselves, I shall add here such as involve any difficulty, or which require any illustration.

The first which occurs is the integration of the differential—

$$\frac{x^2\,dx}{\frac{b^3}{d^3}(2\,l\,x - x^2)^{\frac{3}{2}}}$$

This may be put under the form,

$$\frac{b^3}{d^3}\int x^2\,(2\,l\,x - x^2)^{-\frac{3}{2}}\,dx$$

Or making $2\,l = p$ under the form, $\frac{b^3}{d^3}\int x^{\frac{1}{2}}\,(p - x)^{-\frac{3}{2}}$

Now the part under the integrating sign in a series becomes,

$$\int \frac{x^{\frac{1}{2}}\,dx}{p^{\frac{3}{2}}} = \frac{2}{3}\frac{x^{\frac{3}{2}}}{p^{\frac{3}{2}}}, \int \frac{3\,x^{\frac{3}{2}}dx}{2p^{\frac{5}{2}}} = \frac{2}{5}\cdot\frac{3x^{\frac{5}{2}}}{2p^{\frac{5}{2}}}, \int \frac{5\cdot 3\,x^{\frac{5}{2}}dx}{4\cdot 2p^{\frac{7}{2}}} =$$

$$\frac{2}{7}\cdot\frac{5\cdot 3\,x^{\frac{7}{2}}}{4\cdot 2p^{\frac{7}{2}}}, \int \frac{7\cdot 5\cdot 3\,x^{\frac{7}{2}}dx}{6\cdot 4\cdot 2p^{\frac{9}{2}}} = \frac{2}{9}\cdot\frac{7\cdot 5\cdot 3\,x^{\frac{9}{2}}}{6\cdot 4\cdot 2\,p^{\frac{9}{2}}} \text{ &c. &c.}$$

Which, when $x = \frac{1}{2}p = l$, may be written,

$$\frac{1}{\sqrt{2}}\left\{\frac{1}{3}\cdot\frac{1}{1} = .3333, + \frac{1}{5.2}\cdot\frac{3}{2} = .15000, + \frac{1}{7.2^3}\cdot\frac{5\cdot 3}{4\cdot 2}\right.$$

$$= .06695, + \frac{1}{9\cdot 2^5}\cdot\frac{7\cdot 5\cdot 3}{6\cdot 4\cdot 2} = .03040, \text{ &c.}$$

This series, after a few terms, may be considered nearly equivalent to a geometrical series, having the ratio $\frac{1}{2}$, and may be summed accordingly. We have thus ultimately for the original expression,

$\frac{b}{d^3} \times \frac{1}{\sqrt{2}} \times .6095$, &c. $= .41\,\frac{b}{d^3}$ as given in p. 122.

Note to p. 198.

It may be convenient to show the origin of these formulæ, particularly the third, which is not investigated in the preceding pages, except that it has been shown, generally, that if d' denote the depth of the lower fibre below $n\,n$, and its tension be made $= t$, and any variable distance $= x$,

That $\frac{t}{d'}\int x\,dx =$ sum of all the tensions to a unit of breadth.

That $\frac{t}{d'}\int x^2\,dx =$ sum of all the resistance referred to the axis n.

And $\dfrac{\frac{t}{d'}\int x^2\,dx}{\frac{t}{d'}\int x\,dx} = \delta'$ distance of centre of tension.

From which it follows, that $\frac{t\delta'}{d'}\int x\,.\,dx =$ sum of all the resistances for a unit of breadth, x being taken in its ultimate state.

Now, in the rib, when $x = d'$, $\delta' = \frac{2}{3}\,d$, and $\int x\,dx = \frac{1}{2}\,d'^2$,

whence the above becomes $\frac{1}{3}\,d'^2\,t$; but to refer this to the centre

of compression c, we have (calling the whole depth d) $\frac{2}{3} d' : \frac{2}{3} d :: \frac{1}{3} d'^2 t : \frac{1}{3} d d' t$; and introducing the breadth $p\,q$, it becomes $\frac{1}{3} h s . n s . p q . t$.

In the same way, calling the tension at $x = t'$, and the breadth $(n\,n - p\,q,)$ we have for the resistance of the head, $\frac{1}{3} h x . n x . (n\,n - p\,q)\,t'$; but the tension at $x = \frac{n x}{n s} t$; therefore, substituting this for t', we have $\frac{1}{3} h x . \overline{n x^2} \frac{(n n - p q)}{n s}$.

For the lower web—

$$\frac{\frac{t}{d'} \int x^2 d x}{\frac{t}{d'} \int x\, d\, x} = \delta'$$

Calling $n r = d''$, and x any variable distance below r, it becomes—

$\int \frac{(d'' + x)^2 d x}{(d'' + x) d x} = \delta'$; which, when $x = r s$, gives $\delta' = n m + \frac{r s^2}{12 m n}$ and $\frac{t}{d'} \int (d'' + x) d x = \frac{t \delta'}{d'} n m . r s$, whence the resistance referred to $n\ n$ is, for the breadth $(m m - p q)\ n m . r s\ (m m - p q) \frac{t \delta'}{d'}$; and calling $\delta' + n c = \delta''$, it is, when referred to c, $n m . r s\ (m m - p q) \frac{\delta'' t}{d'}$ which is the formula in question.

In a similar way, the formula for the trapezoidal rail is obtained.

Note to p. 267.

Another equation, on which it may be well to offer a few remarks, is that given in p. 267, viz:

$$\frac{1}{3} \left\{ 5\,(5 - x)\,9 + \frac{11 . (1 - x)^2}{(5 - x)} \right\} = \frac{8\frac{1}{4} \times 33}{4}$$

This is drawn from the general solution, p. 265, viz: $\frac{1}{3} h s . n s .$

$p\,q\,.\,t, + \frac{1}{3}\,h\,x\,.\,\overline{n\,x^2}.\frac{n\,n - p\,q}{n\,s} = s$, and $\frac{4\,s}{l} = w$.

Taking the result of the experiments, p. 270, at $w = 8\frac{1}{4}$, and the dimensions of that bar as known quantities, every thing in the above is given, except the position of the line $n\ n$. Calling, therefore, $h\,n = x$, and substituting the proper numerical values for the other parts, we have,

$$\frac{1}{3}.\,5\,.\,(5-x)\,.\,9 + \frac{1}{3}\,(1-x)^2\,.\,\frac{1\,.\,1}{5-x}.\,10 = \frac{33\,.\,8\frac{1}{4}}{4}$$

This reduces first to $45\,(5-x)^2 + 11\,(1-x)^2 = 204.18\,(5-x)$, then to $x^2 - \frac{267.82}{56}x = -\frac{115.1}{56}$, whence the value of $x = .484$.

Here t is taken at ten tons, according to our first mean results; but if, instead of this, we consider it, like x, as an unknown quantity, the equation is, $4.5\,t\,(5-x)^2 + 1.1\,t\,(1-x^2) = 204.18\,(5-x.)$ that is, t and x are dependent quantities, and every change in the value of t produces a corresponding change in the value of x.

If $t = 10.5$, then the equation is, $45\,(5-x)^2 + 11\,(1-x)^2 = 194.54\,(5-x)$; whence $x = .736$.

Again, we may find x quite independently of these considerations, by taking the ratio of the surfaces of tension and compression found in p. 194, viz: 1 : 4, and these into the distances of their respective centres of gravity; or, which is the same, the whole quantity of compression to that of extension, as 1 to 4^2.

Considering this as a general law, and dividing our area accordingly, we have $16\,x^2 = (1-x)^2 + 3.6\,(3-x)$, or $16\,x^2 + 5.6\,x = 11.8$; from which we find $x = .720$.

Hence it appears that, whatever method is pursued, the resulting numbers are exceedingly approximative. It has, however, been thought best for the object in view, to derive our final data from that case most resembling the actual subject of inquiry, which is that of railway bars having necessarily an upper table; and in these, t being taken as equal to ten tons in good iron, the neutral line may be considered to divide the area of the upper table into two equal parts, and on these are founded the rules given in p. 267. In other cases it will be better to determine x, as in the last case, and proceed by the general rule.

I know that it has been advanced, on theoretical principles, that at the commencement of strain, the neutral axis is in the centre of gravity of the area of the section, but this consideration does not enter into my investigation. I have not examined the question on theoretical, but on mechanical principles, with a view to one specific object, and have purposely avoided resting any point on mere hypothesis. Every thing is made to depend on experimental results; and, from the uniformity and agreement of these, I have every confidence that the rules founded on them will enable practical men to compute such cases as may occur, with all the precision that can be desired.

As another example, let it be proposed to find the strength and deflection of Mr. Stephenson's rail inverted.

Call the distance of the neutral axis from the top, $hn = x$. (Fig. p. 266.)

Then $.9\,x$ = area of compression, $\frac{1}{2}\,x$ = distance of centre of gravity; $\overline{.45\,x^2}$ = quantity of compression.

Again, $.9\,(5-x)$ = area of extension of the middle rib; $\frac{1}{2}(5-x)$ = distance of centre of gravity; $\overline{.45\,(5-x)^3}$ = quantity of extension of middle rib.

Also, 1.1 = area of lower web; $(4.5-x)$ = distance of centre of gravity; $\overline{1.1\,(4.5-x)}$ = quantity of extension of lower web.

Since as compression to extension, so is $1^2 : 4^2$, we have $7.2\,x^2 = .45\,(5-x)^2 + 1.1\,(4.5-x)$ or $x^3 + .829\,x = 2.4$, whence $x = 1.185$, or 1.2, nearly.

Now, by the rules for the middle rib and lower web, (p. 265,) we have $hs = 5$, $ns = 3.8$, $pq = .9$, $t = 10$, and $\frac{1}{3}\,hs \,.\, ns \,.\, pq \,.\, t =$ . . . . . 57 tons

Also, nm 3.3, $mm - pq = 1.1$, $d' = 3.8$ $s'' = nm + \frac{1}{12\,.\,\overline{mn}^2} + cn = 4.1$

Wherefore, $nm \,.\, rs\,(mm - pq)\frac{s''}{d'}\,t =$ 39.1

96.1

$\frac{96.1 \times 4}{33} = 11\frac{7}{11}$ tons, the greatest weight.

$\frac{.22}{3.8} \times \frac{4}{3} = .0772$, deflection with that weight.

Whence in the two positions of the rail we have,
$8\frac{1}{4} : 11\frac{7}{11} :: 1 : 1.4$ ratio of strengths.
$3.8 : 4.5 :: 1 : 1.18$, ratio of ultimate deflections.

$\frac{3.8}{8\frac{1}{4}} : \frac{4.5}{11\frac{7}{11}} :: 1 : .84$, ratio of deflections with equal weights.

¶ *On the Practicability of alloying Iron and Copper.* *By* David Mushet, *Esq.*

In perusing, the other day, Dr. Lardner's third volume on metals,* I met with the following unqualified assertion: "As to alloying cop-

* "Manufactures in Metal, vol. iii. Tin, Lead, Copper, Gold, Silver, and various Alloys," p. 174.

per with iron, the notion not only appears absurd, but unsupported by evidence." As at the present moment Dr. Lardner's publication may be considered a text-book of popular instruction, such a statement might lead to a settled conclusion that to alloy iron and copper is, under all circumstances, impossible. Now the contrary is the fact; and having considered this operation for many years as one which, if happily effected, would materially contribute to the perfection of many of our mechanical contrivances, I hope I shall be excused for entering on the subject somewhat particularly.

In the first place, I see no *prima facie* reason why it should be absurd to expect that iron should unite with copper as well as it does with other metals. Then as to the evidence, I think that most chemical works state the fact as a matter of course, never doubting the practicability of the measure; and in your own Magazine, vol. xlix., I find some experiments on the union of iron with copper; which shows that the subject has not been recently altogether overlooked. The uncertainty which prevails upon the subject arises from the want of accuracy in defining the nature and quality of the iron which has been the subject of the union. Most of the books entirely overlook the various states of iron, and fail to distinguish whether the subject-matter of the experiment was cast iron, or steel, or iron in a state of malleability. The same remark applies to the experiments of Mr. P. N. Johnson as above, who, though he states that he effected an union between iron and copper, yet leaves it doubtful whether the iron was not steel or cast-iron instead of pure or malleable iron. The well-known affinity of iron for carbon precludes the possibility of malleable iron being heated and melted in contact with a large dose of charcoal (as was the case in his experiments,) without its passing into the state of steel, or cast-iron; so that the experiments of Mr. Johnson may be considered as representing, not the union of copper with wrought or malleable iron, but with cast steel or crude iron. Whether or not these were examples of a real chemical alloy, or of a mere mechanical mixture, may be gathered from the following remarks, which are grounded on an extensive series of experiments.

It had for many years appeared a desideratum to me to form castings for shafts, cranks, levers, beams, &c., of a substance that should possess the stiffness of cast, together with the power of tension and strength of wrought iron. It occurred to me that such a discovery would enable the engineer to construct more complete and convenient forms (particularly in the machinery belonging to steam-boats and locomotive engines,) than he is at present able to obtain from the cumbrous forging, turning, and fitting of malleable iron. Such an union of strength I naturally sought for in a mixture of iron and copper; and knowing that the copper ores of this country are principally sulphurets of iron and copper, I commenced my experiments by attempting the joint reduction of the iron and copper. After many failures I so far succeeded as to effect a perfect reduction into malleable matter of the whole contents of any given sulphuret. But upon examining the results, it was found that a very great uncertainty

prevailed as to their strength and quality; and I soon ascertained that I had only succeeded in obtaining a perfect separation from the ore, of the united products of iron and copper. These masses of alloy were arranged and classified as follows:

1st. Ingots of a coppery coloured surface, covered with an exterior blackish shale in cooling resembling iron; breaking with a pale uniform homogeneous fracture, and producing an action more or less on the magnetic needle.

2ndly. Ingots with a gray coppery surface, covered also with an exterior blackish shale in cooling resembling iron, the under surface of a deep red coppery colour. Fracture specular, and beginning to exhibit distinct grains of copper apart from the iron, as if this metal had been saturated with copper. Small hard and bright iron points appeared under the file. These ingots were obedient to the magnet.

3rdly. Ingots with an iron-coloured surface, and coppery tints displayed under a black thin shale. Hard, and filing to a coppery colour, mixed with bright spots. Fracture specular, exhibiting a mixture of iron and copper, in which the former appeared to prevail. Powerfully acted on by the magnet. The lower surface cellular and crystallized, resembling products of fused steel.

Though I have divided these products into three classes only, yet I obtained many intermediate results, the iron present in which I estimated at from 5 to 70 per cent. of the weight of the copper. Beyond 5 or 7 per cent. of iron, no chemical union took place; and as the quantity of iron revived, was in proportion to the charcoal added, so in the same proportion did the separation of the two metals from each other take place. From this it was inferred that malleable iron (*i. e.* iron containing the least possible quantity of charcoal,) would unite and form a proper alloy with copper, but that steel or cast iron would not do so. To try the validity of this reasoning, a new series of experiments was instituted, having for their object the direct union of a portion of copper with iron in various states of cast iron, steel, and malleable iron, the general results of which I will state as briefly as possible, without going into a detail of the various experiments.

Pure malleable iron may be united with copper in any proportion, until it equals, or even exceeds, the weight of the copper; the intensity of the copper colour increases, till the quantities are equal; and the fracture then becomes paler, in proportion as the quantity of iron exceeds that of copper. With 50 per cent. of iron the alloy possesses great strength: its hardness increases with the quantity of iron, but its strength afterwards decreases, and in cutting, it opens before the chisel. The loss of strength in proportion as iron is added, arises, I imagine, from the fibre of the copper being injured by the very high temperature required to fuse the increased quantity of malleable iron. The fracture of the ingots thus obtained is always specular, with a glance arrangement, which betokens a tendency to brittleness.

If steel is fused with copper in the proportion of one-twentieth of the latter to nineteen-twentieths of the former, an ingot resembling, and

crystallized like, cast steel, will be obtained, but useless for forge purposes, and incapable of receiving an edge. Not the slightest symptom of copper, either on the surface or in the fracture, can be perceived, but a very considerable increase of hardness may be observed.

When copper is fused with one-tenth of its weight of bar steel, an ingot is obtained which outwardly resembles the former, with the radiated linear crystallization less distinct. But the fracture, which is hard and brittle, shows, by minute points of copper, the commencement of an indisposition, or inability, to further union, or alloy, between the two metals.

Again, when one-fifth the weight of copper is added of steel, an ingot is obtained which exhibits, when filed, a partially coppery appearance, of a deep red on the lower, and steel bright on the upper surface. The fracture displays a regular grain, which indicates an intimate mixture of copper and iron, apparently of greater strength than in the two former alloys.

When one-third of copper is added to the steel, the former seems to separate, and sinks in considerable quantities, in a soft and malleable state, to the lowest part of the crucible. The fracture exhibits the copper in streaks and knots, indicating a decided want of union*.

White cast-iron, which resembles steel in the quantity of carbon which it contains, affords nearly the same result when fused with similar portions of copper; the alloy, however, possesses less strength, and a greater tendency to disunion when the proportion of copper is increased beyond one-twentieth.

The union of copper with gray cast-iron, if at all practicable, must take place in very minute quantities; for in fusing 5 per cent. of copper along with No. 1, or smooth-faced pig iron, specks of deep red coloured copper were found upon the lower surface of the ingot, and similar traces were discernible in the fracture. With one-tenth the copper became of a deep red colour, separated in leaves, and attached itself to the outside of the cast-iron; and when copper to the extent of one-fifth was tried, a solid bottom of copper was found beneath the cast iron in the bottom of the crucible.

From all I have learnt on this subject, I conclude that copper unites with iron in proportion as the latter is free from carbon; hence it would appear impossible to produce a mixed metal, or alloy of copper and iron, by smelting in a blast furnace, in contact with carbonaceous matter, an ore containing both these metals. It is true that we have ores which, when properly smelted, would afford at the first fusion crude steel, which contains a minimum dose of carbon, and to which might be added as much copper as would chemically unite with it, probably from 5 to 7 per cent. But this quantity, I am afraid, would be too small to form an alloy possessed of the strength

* Steel, both English and Indian (or wootz), was alloyed with copper, in the proportion of two per cent. of the latter, by Messrs. Stodart and Faraday, in their experiments on the Alloys of Steel; but of the value of this alloy, they observe, "we have doubts." They did not attempt to produce it in the large way. See Quart. Journ. of Science, vol. ix. p. 325, 329; and Phil. Mag. vol. lvi. pp. 31, 54; vol. lx. p. 371.—Edit.

and power of resistance necessary to make castings for the purposes already mentioned.

Though I have clearly established, by numerous experiments, the practicability of a perfect union of malleable iron with copper, in every reasonable proportion, yet as this alloy can only be made in a close crucible, it is obviously impossible to employ it for castings of a considerable weight or size. I do not, however, despair of overcoming this difficulty, and of gaining the object I have long had in view, by a different system of alloy, in which copper must necessarily form an essential ingredient. [*Rep. Pat. In.*

¶ *Experiments on the Preservation of Sheet-Iron from Rust, in India.* *By* James Prinsep, *Esq.*

The proposed extensive employment of iron steam boats, for the navigation of the Ganges, rendered it a desideratum to ascertain what varnish or composition would best preserve the exterior surface of such vessels from the rapid corrosion to which iron is so peculiarly subject in a hot climate. A series of experiments was undertaken with this view by myself, at the requisition of government; and it may perhaps be useful to record the principal results, in a journal of science.

Two sets of six wrought-iron plates, each measuring 3 feet by 2 feet, were fixed to two iron triangles, the plates being prevented by studs from coming into contact with each other. The same varnishes were applied to both sets, one being intended for entire submersion under water, the other to be only half immerged, in order to [that it might] feel the united influence of air and water.

The following were the coatings applied:

1. Common coal-tar laid on hot, and the plate heated.
2. *Thetsee* varnish of Ava, one coat. This took a very considerable time (two months) to dry, kept first in a cool room, and afterwards in a room heated by furnaces.*
3. Native *Dhúna*, applied to the iron hot, in a thick uneven coat.
4. Best white-lead paint, 3 coats; allowed to dry and harden for nearly three months.
5. Coachmakers' varnish, two coats; dried rapidly.
6. Spirit varnish, several coats; warmed.
7. White wax, melted on the surface.
8. White wash, of pure lime water.
9. The surface of the iron plate cleaned and guarded with an edging of zinc, soldered on.
10. The natural surface of the rolled iron sheets, covered with its usual hardened grey oxide.

* Major Burney states, that three or four days are sufficient for the varnish to dry when laid on wood, (Journal, vol. i. p. 172.) I had not a damp vault in which to expose plate as recommended by that officer, and that may partly account for the delay in drying; but all varnish and paint takes longer to dry on metal than on wood, from its non-absorbent nature.

Many of the foregoing were employed from curiosity only, especially No. 6, the spirit varnish, which had, on many occasions, proved quite ineffectual in preserving the surface of polished iron and steel from rust in the atmosphere of Calcutta.

The two frames were suspended as above described, one under water, the other half immersed, from one of the unused dredging boats, near the Chitpur lock gates, in the circular canal, where they were left undisturbed for three months, during a period of the year when the water of the canal was only slightly salted.

They were then taken up for examination, and presented the following appearances.

No.	Varnish.	Plates under water.	Plates half above water.
1	Tar	Perfectly preserved and free from rust.	A few dots of rust between wind and water.
2	Thetsee.	Perfectly uninjured in appearance.	A line of rust at the level of the water.
3	Dhúna.....	White and pulverulent; soft and easily rubbed off while wet: rust here and there.	Large cracks from the contraction of the part exposed to the sun, whitened where thick, black where thin; plate preserved above water.
4	Paint.....	Almost wholly disappeared, and blotches of rust on the surface.	Paint uninjured above water mark, and plate preserved, but below water entirely removed.
5	Copal Varnish	Whitened, pulverulent, and soft; but not much oxidated.	In air less whitened, spots of rust breaking out every where,
6	Spirit Varnish	Whitened and very rusty.	Very much corroded.
7	Wax.....	No trace of wax left, and very rusty.	This plate was all under water.
8	Lime.....	Flaky, peeled off, and very much corroded.	In air remains on and acts pretty well.
9	Zinc.....	The clean iron excessively corroded and bad: the zinc also oxidated.	Much more rusty in the air than under water, where a kind of crust was formed.
10	None.....	The natural surface was a little whitened and pretty well preserved.	Rusty on the edges or where it had been scraped; elsewhere little injured.

The superior preservative power of coal-tar to all the substances tried, with the exception perhaps of the thetsee, was evident; the Burmese varnish laboured under the disadvantage of being a single coat, otherwise it would doubtless, from its hardness, its firm adherence, and its inalterability by water, prove fully equal as a lacquer to the coal-tar: the latter has, on the other hand, the advantage of drying and hardening as soon as laid on.

The change effected on the resinous varnishes is produced by an actual chemical combination with the water; the soft pulverulent matter is analagous to the white powder obtained by the addition of water to an alcoholic, or to an acid, solution of resin.

The failure of the zinc guard, which was expected to act as an

electro-positive protector to the iron, may, I think, be attributed to its being adulterated with lead, which being negative with respect to iron, would cause, as was actually the case, a more rapid oxidation of the latter metal: (the impurity of the zinc was afterwards fully proved.)

The wax and the white paint had entirely disappeared from the surface of the metal under water, before the plates were taken up; it is impossible, therefore, to say in what way their removal was effected.

The bituminous (coal tar) coating was finally adopted, and it has been successfully applied to the iron steamer, the Lord William Bentinck, lately launched under Captain Johnson's superintendence.—[*Jour. As. Soc. Ben.* *Rep. Pat. Inv.*

¶ *On Turnouts in Railroads with flexible moveable Rails. By* Thomas Gorton, Civil Engineer.

At a time like this, when Railroads are being rapidly introduced in various parts of the United States, it is believed that any improvement relating to the various parts of their construction will be acceptable to the public.

Up to the present time all turnouts upon railroads, (so far as the writer's knowledge extends,) have been constructed with stiff moveable rails. When these stiff rails are moved round so as to make a communication with the turnout and main line a rectilinear angle of several degrees is formed by the stiff rail and main line, which subjects cars passing through the turnout, to much jar and lateral friction. This friction is so great as to injure both cars and railroad. In a late conversation with Mr. E. Miller, Superintendent of machinery on the Portage railroad, he informed me that they proposed using *flexible* moveable rails for their turnouts. The rail adopted on that road is the parallel edge rail, eighteen feet long, and weighing forty pounds per yard. I understood that the plan of their turnouts was not fully matured, but that it was contemplated to have about three feet of the rail made fast in two heavy chairs, and the other fifteen feet to be sprung into a curved form, when it was desired to pass into the crossing or turnout.

This, at once appeared to me to be a decided improvement, in as much as turnouts might be made on this principle, so that cars might pass through them with the same facility as in the curved parts of the main line. In examining the subject, the first requisite is, that the rail at the moveable end should be deflected so as to leave a sufficient distance between the rail of the main line and the fixed part of the turnout. Then secondly, let the radius of curvature for the turnout be determined. It will be seen that these two requisites determine the length of the moveable rails. These rails may then be laid down in the following manner.

Let about one foot of that part connected with the main line be made fast in a heavy cast-iron chair, by a wedge and by a bolt passing through the chair and rail. The moveable part of the rail may

be supported on chairs; these chairs to rest on cast iron seats having a ledge on one side for the chairs to slide against when the rail is sprung round into the turnout. The seats consequently must be laid down in the curved form which the rail is to assume in the turnout. If it is thought that the chairs on this part of the rail will work out of place, they may be bolted to it, or secured in some other manner by guides on the seats. The two moveable rails of a turnout should then be connected by two or three stiff coupling bars to give them permanence, and preserve the proper distance between them. The rails may then be worked by a vertical lever of a suitable length. This lever with a ball placed upon its top will serve as an index to persons travelling the road, by pointing out the position of the moveable rails, that the cars may be stopped in time if the rails are not right.

The results of some calculations for rails of different lengths, will now be given, together with the length of a turnout for each kind of rail. These calculations are made for a double track of railroad, the distance between the rails of each track being 4.75 feet, and the distance between the inner rails, including the width of each rail, five feet. But as railroads in general, do not differ much from this in outline, the length of a turnout will not be affected much by such difference.

The following table will be understood from the explanation given therein.

Radius of curvature in feet.	Length of moveable rail not including that part in the heavy chair.	Deflection at end of rail in decimals of a foot.	Angle of crossing plates and sine of arc at each end of turnout, in feet.	Feet of straight line in the center of turnout.	Length of turnout in feet.
310.	15 feet.	0.36	7° 37.78	40	115
350.	16	0.36	7° 42.65	35	120
400.	17	0.36	7° 48.75	30	128
410.28	17	0.35	7° 50.00	29.6	129.6
450.	18	0.36	7° 54.84	23	133
500.	19	0.36	7° 60.93	17	139
550.	20	0.36	7° 67.03	11	145

In the above table, fractions of a foot have been omitted in the last two columns, the object being to give sufficient information in a tabular form, from which a comparison of the advantages, and disadvantages may be made for turnouts with moveable rails of different lengths, and arcs of different radii. An angle of 7° has been adopted in this table for the crossing plate. Increasing this angle would shorten the turnout but little. It is hardly necessary to mention that the plan of the turnout proposed here, is that of an inverted curve, with a piece of straight line in the centre.

It is believed that a turnout of from 400 to 500 feet radius, with flexible moveable rails, will be found to answer a much better purpose than those in use at the present time. Several important railroads have curves as abrupt as this. On the Baltimore and Ohio railroad there are two sharp curves, one of 337, and the other of only 318 feet radius. [*Silliman's Jour.*

¶ *On the Fusion and Appearance of Refined and Unrefined Copper.* *By* David Mushet, Esq.

The following are "a few extracts from experiments made some years ago, with a view to ascertain what effect would be produced upon the strength and malleability of copper, by retaining, to a certain extent, the alloy (chiefly tin), which is found in rough copper, and which it is the purpose of the refinery to discharge. In the first place, I obtained a quantity of shotted rough copper, made from the furnace in which the copper, though alloyed with other matters, first appears in its metalic form. These shots were light and flaky, hard when struck, but at the same time partially ductile. A quantity of pure shotted copper, made from the refinery, and having the form of flattened spheroids, and much denser than the other, was procured at the same time for the purpose of these experiments

Exp. No. 1. A quantity of rough copper was fused in a black-lead crucible with nearly an equal bulk of charcoal, and poured into an open iron mould. The bar or ingot thus made, was $\frac{3}{4}$ of an inch thick, and when cold and broken, was found to have crystallized in converging striæ perpendicular to the upper and lower surfaces, and declining towards the outer edges of the bar. The grain was of a pale colour inclining to gray, indicating the presence of tin.

Exp. No. 2. Three bars procured in this way were melted together in a black-lead crucible without charcoal, and poured into a mould just at the moment when the melted copper put on a creamy appearance. When cold, the surface of the ingot thus obtained, was less coppery-metallic than the surface of the ingot in the first experiment, where charcoal was used; from which it may be inferred that, owing to the absence of charcoal, a certain degree of refinement had taken place. The fracture possessed more of the red grain of good copper; the striæ were less distinct and less crystalline; and the surface instead of being convex, as in the first experiment, was concave.

Exp. No. 3. Some of the pure shotted copper was fused in a black-lead crucible with an equal bulk of charcoal, and the resulting ingot presented a more clean and perfect mass of copper than the ingots obtained in Experiments No. 1 and No. 2. The fracture presented a series of brilliant striæ arranged from surface to surface, breaking off easily in the direction of the perpendicular fibre, a structure which seems wholly incompatible with extension or malleability.

Exp. No. 4. Some of the same pure copper melted similarly, but not poured into the mould until it had nearly lost its fluidity, formed an ingot less striated or crystallized than any of the former, with more of that minute deep orange-coloured grain which is peculiar to pure and malleable copper. From the results of this experiment, and of No. 2, it would seem that when copper is poured into the mould at as low a temperature as is consistent with perfect fluidity, the fracture is less crystallized, and the colour approximates to that ruby grain which indicates the malleable state of copper.

Four bars, one from each of the foregoing experiments, were imbedded in burnt lime, shut from the access of air, and exposed in crucibles to the same temperature. The pure copper bars (Nos. 3

and 4) were on the surface considerably oxidated, but those made from the rough copper (Nos. 1 and 2) were entirely free from oxide; and from this it may be inferred that the alloy (principally tin) which still remained in the copper, prevented waste or oxidation. The bar from Experiment No. 1, was not cut, but that from Experiment No. 2, retained about the same quantity of grained striæ as before the cementation; though, compared with a fracture of the same copper that had not been cemented, the grain was redder, the colour more brilliant, and the metal more ductile. The bar from Experiment No. 3, was covered with a thin coating of crystallized oxide exceedingly soft; the striæ were more enlarged and adhesive, so that the copper, in cutting, tore out in flakes, which separately were soft and ductile. The bar from No. 4, when examined and compared with an uncemented one, was more open in the grain, redder, and more brilliant; but the quantity of depth of grain was nowise altered, although the metal cut softer, and was covered with a thin crust of shining oxide. From these details it may be presumed, that cementation opens the grain, renders the bar less dense, but does not change the peculiar form of the arrangement. In each case the copper after cementation was softer, a change which seems favourable to rolling cold. The impure or rough copper appears to be alloyed with another metal (no doubt tin,) which prevents that oxidation which pure copper in the same circumstances would undergo.

Besides the above, several bars were made from the rough copper by a slower fusion, and with a longer exposure to the charcoal, and it was observable, that the longer the exposure, and the slower the fusion, the more yellow and refined was the copper in the bar.

Some of the bars produced in the course of these experiments were attempted to be rolled; but the success was various. Of those made from the pure copper, some rolled better and others worse than any made from the rough copper: one or two bars of the latter were equally malleable with the former; but none rolled well either hot or cold. In those bars in which the striated arrangement was most perfect, the capacity for rolling was least, and those in which the minute granular fracture prevailed, generally rolled the best. It certainly does appear that this tendency to crystallize, so destructive to malleability, is peculiar to English copper made from the crucible. There are occasions, no doubt, when the proper temperature being hit upon, the bar would roll; but these occasions are so rare and uncertain that English copper made in this manner could not be relied upon in the manipulations connected with manufactures. There is no question that the arts in this country suffer from the peculiarity of English copper. For, in consequence of it the malleabilization of that metal is necessarily confined to the original process of refining practised on the great scale by the copper smelters. It is very different with Swedish and Russian copper, which I have seen melted in considerable quantities in large crucibles, cast into cakes or thick sheets, and afterwards rolled into boiler-plate and thin sheet-copper. This subject requires and deserves a scrutinous examination, with a view to discover the cause of the uniform tendency of English copper to crystallize; and that cause may, perhaps, be found in the process

employed in this country for the smelting of copper ores, a process which, however economical and well calculated to overcome quantity, has never yet produced pure copper. [*Lon. Edin Phil. Mag.*

¶ *On the Preparation of Bistre.*

This colour, used by painters in the manner of Indian ink, is prepared from wood soot, in the following manner. Make choice of those pieces of soot which are the hardest, and adhere most to the chimney; pulverize them, and pass the powder through a fine sieve. Throw this powder into pure water, stir it from time to time with a glass spatula, leave it at rest, and, finally, pour off the water. This water dissolves all the foreign salts. We may hasten their solution by placing the glazed earthen vessel containing the solution over a fire. When other water, on being added, will no longer dissolve any salt, and it remains of the same degree of specific gravity as before it was employed, we put the sediment into a tall narrow vessel, which is to be filled with water, and agitate it with the spatula; it is then left at rest for a few minutes, in order that the coarser parts may settle. The liquid is then to be poured into another similar vessel, and the coarser parts remaining at the bottom of the former one may be thrown away as useless.

This operation may be repeated two or three times, and the oftener, the finer will be the bistre. It must be finally left at rest for some time, and the clear water poured off from the sediment, which is to be incorporated with gum water, and it is fit for use. [*Dict. Tech.*

List of American Patents which issued in August, 1835.

		August
441.	*India rubber, spreading, &c.*—William Atkinson, New York,	15
442.	*Saw set.*—Theodore Taylor, Port Deposit, Md.	15
443.	*Churn.*—Joseph Turner, Portland, Maine,	15
444.	*Corn sheller.*—Joseph Turner, Portland, Maine,	15
445.	*Candles, making.*—Willard Morey, Charlestown, Mass.	15
446.	*Cartouche Box.*—Robert Dingee, city of New York,	15
447.	*Grass seeds, hulling.*—Samuel Gould, Jr., New Portland, Maine,	15
448.	*Cooking stoves.*—Solomon Dickinson, Richmond, Indiana,	15
449.	*Tanning.*—Henry C. Locker, Lancaster, Pennsylvania,	15
450.	*Cutting and press machine.*—Benjamin Morris, Oxford, N. Y.	15
451.	*Shoe pegs, splitting.*—Mark Wilder, Peterborough, N. Y.	15
452.	*Rotary pump.*—David M. Walker, Cavendish, Vermont,	15
453.	*Potash, making.*—Elijah Williams, Harbor Creek, Pa.	15
454.	*Ship building.*—Charles Olcott, Medina, Ohio,	15
455.	*Washing and bleaching machine.*—Calvin H. Farnham, Norwich, Conn.	15
456.	*Shingle sawing machine.*—David B. Moore, Stafford county, N. H.	15
457.	*Brick machine.*—George W. Gilbert, Pittsburg, Penn.	15
458.	*Bricks for roofs, &c.*—James Parker, Gardiner, Maine,	15
459.	*Press for cotton, &c.*—E. Macomber & L. L. Macomber, Gardiner, Me.	15
460.	*Evaporating and condensing solvents.*—J. Golding, Boston, and R. Brackett, Lynn, Massachusetts, ...	15
461.	*Stove for heating irons.*—John Lewis, Derby, Conn.	17
462.	*Water lime cement for roads.*—Joseph Robey, Jr., Albany, N. Y.	17
463.	*Churn.*—Caleb Angerine, city of New York,	17

		August
464.	*Harpoon.*—Caleb Angerine, city of Boston,	17
465.	*Wire door spring.*—John Codman, city of Boston,	17
466.	*Heat, saving, in steam boilers.*—Tunis V. Leroy, Buffalo, New York,	17
467.	*Power loom.*—Amasa Stone, Providence county, Rhode Island,	17
468.	*Gates for canal locks.*—David Wilkinson, Cahoes, New York,	17
469.	*Silk, unwinding and spooling.*—Gamaliel Gay, Poughkeepsie, N. Y.	17
470.	*Mowing machine.*—John P. Chandler, Wilton, Maine,	17
471.	*Woollens, printing and dying.*—William Duncan, Belville, N. J.	17
472.	*Wheel, spiral band.*—Samuel G. Walley, Chester county, Penn.	17
473.	*Anthracite, breaking.*—Jonathan S. Hubbell, New York,	17
474.	*Grain, grinding and chopping.*—Pierson Cope, Fayette county, Pa.	17
475.	*Pocket pistol.*—Victor M. Wallace, West Topham, Vt.	17
476.	*Cooking stove.*—Ezekiel Gore, Jr., Guilford, Vermont,	17
477.	*Tide power.*—Henry B. Furnald, Portland, Maine,	17
478.	*Saddletree.*—John M. Bouton, Newark, New Jersey,	17
479.	*Plummer blocks, &c.*—Matthias W. Baldwin, Philadelphia,	17
480.	*Oil of Harze.*—Preswick & Fisher, New York,	17
481.	*Composition of Plaster, &c.*—Julius Hatch, Great Bend, Penn.	17
482.	*Brushes.*—William Steel, New York,	17
483.	*Screw wrench.*—Solyman Merrick, Springfield, Mass.	17
484.	*Vapour bath.*—Peirce P. N. D. Alrigny, New York,	17
485.	*Sawmill saw.*—Levi Fisk, Schroon, Essex county, New York,	17
486.	*Churn.*—Clifton C. Stearns, Bucksport, Maine,	17
487.	*Pendulum lever.*—Asahel Munger, Oberlin, Ohio,	17
488.	*Planing machine.*—Fisher Stedman, Aquackanackin, New York,	17
489.	*Chairs, making.*—Eli F. Benjamin, Utica, New York,	17
490.	*Rotary steam and air engine.*—George Cameron, Washington, D. C.	17
491.	*Hemp and flax, dressing.*—John Goulding, Boston, Mass.	17
492.	*Horse power.*—Benjamin Wales, Hallowell, Maine,	17
493.	*Cholera medicine.*—Robert S. Barnard, Norfolk, Virginia,	17
494.	*Cooking stove.*—Edward N. Kent, Portland, Maine,	17
495.	*Metallic roofing.*—Charles Bonnycastle, Charlottesville, Va.	17
496.	*Grain and flour, drying, &c.*—James Lee, Maysville, Kentucky,	17
497.	*Rigging ropes.*—James Fales, New Bedford, Mass.	20
498.	*Grist mill.*—Adna L. Norcross, Hallowell, Maine,	20
499.	*Spinning hemp, &c.*—Andrew Caldwell, Lexington, Kentucky,	20
500.	*Forcing pump.*—William Douglass, Middletown, Conn.	20
501.	*Stove backs and linings.*—Joseph Putnam, Salem, Massachusetts,	20
502.	*Granaries.*—John Harmony, Chambersburg, Penn.	20
503.	*Cultivator and harrow.*—Peter Clark, Aurora, New York,	20
504.	*Bricks, pressing, &c.*—Nathan Reed, Waldo, Maine,	20
505.	*Steam boilers.*—Hunsicker and Krauss, Northampton, Penn.	20
506.	*Washing machine.*—David Warren, Winthrop, Maine,	27
507.	*Washing machine.*—W. & J. Collins, Norwich, Conn.	27
508.	*Hydraulic cement.*—Parker, Clowes, and Garfield, New York,	27
509.	*Cooking ranges.*—Thomas B. Smith, New York,	27
510.	*Arresting sparks.*—Alfred C. Jones, Portsmouth, Virginia,	27
511.	*Turpentine, &c. distilling.*—Isaiah Jennings, New York,	27
512.	*Neck stocks.*—Thomas Goodrum, New York,	27
513.	*Mill gearing.*—Olearaius R. Colman, Barry's Bridge, Va.	27
514.	*Thrashing machine.*—William Matthewes, Charleston, S. C.	27
515.	*Thrashing machine.*—John Gearhart, Rush township, Northumberland county, Pennsylvania,	27
516.	*Mould-boards.*—William Hoth, Buffaloe, New York,	27
517.	*Fire engine.*—Thomas Odiorne, Portsmouth, New Hampshire,	27
518.	*Pump.*—Thomas Odiorne, Portsmouth, New Hampshire,	27
519.	*Grates.*—Ebenezer B. Strong, Buffalo, New York,	27
520.	*Grooving planes.*—James Herman, Fairfield, Ohio,	27

CELESTIAL PHENOMENA, FOR NOVEMBER, 1835.

Calculated by S. C. Walker.

Day.	H'r.	Min.					
4	8	24	Im.	ν Arietis,	,6, N.	51°	V. 0°
4	8	48	Em.			21°	336°
6	13	19	Im.	51 Tauri,	,7,	97°	104°
6	14	47	Em.			303°	347°
6	14	22	Im.	56 Tauri,	,6,7,	118°	154°
6	15	47	Em.			282°	334°
6	18	17	Im.	x^2 Tauri,	,6,7,	152°	208°
6	18	56	Em.			224°	277°
7	0	28	1st ex. contact of Mercury and Sun,			322°	340°
7	0	30	1st internal " " "				
7	3	4	N. App.				
9	16	16	Im.	7^2 Geminorum,	,6,7,	47°	77°
9	17	30	Em.			303°	356

Meteorological Observations for July, 1835.

	⊗	☽	☉	♂	Moon.
Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Wind. Direction.
1	54°	71°	Inches. 29.80	Inches. 29.80	W.
2	55	71	.80	.75	W.
3	63	79	.70	.70	W.
4	64	84	.70	.70	W.
5	66	84	.74	.75	NW.
6	65	75	.90	.85	SW.
7	65	83	.90	.90	Brisk.
8	72	83	.90	.85	E.
9	63	75	.85	.85	do.
10	65	79	.80	.85	SW.
11	60	76	30.00	30.00	W.
12	66	85	.00	29.95	SE.
13	69	86	29.85	.90	W.
14	73	77	.90	.85	W.
15	70	77	1.00	.90	SW.
16	62	73	.65	.75	W.
17	62	73	.80	.85	NW.
18	63	82	.90	.90	W.
19	55	82	.90	.90	W.
20	57	75	.85	.85	SW.
21	57	79	.95	.85	SW.
22	56	80	30.05	30.00	NW.
23	62	80	.10	.10	W.
24	62	80	29.95	29.93	SW.
25	63	80	.85	.86	W.
26	69	86	.90	.90	SW.
27	65	83	30.05	30.05	SE.
28	76	83	.00	29.93	SE.
29	62	72	29.90	.95	SE.
30	66	69	.96	.96	SE. S.
31	65	77	.76	.76	W.
Mean	64.19	79.94	29.85	29.84	W.

Force.	Water fallen in rain.	State of the weather, and Remarks.
	Inches.	
Brisk.		Clear day.
do.		Clear day.
do.		Lightly cloudy—clear.
do.		Clear day.
Moderate.	0.09	Clear—lightly cloudy.
do.		Rain—lightly cloudy.
Brisk.		Fog—clear.
Moderate.		Cloudy—flying clouds.
do.	0.05	Cloudy—rain.
Brisk.		Cloudy—flying clouds.
Moderate.	0.05	Clear—flying clouds.
do.		Drizzle—flying clouds.
Brisk.		Clear day.
do.	0.05	Lightly cloudy—shower.
Moderate.	1.85	Cloudy—heavy showers.
do.		Clear—flying clouds.
do.		Cloudy—clear.
do.		Clear day.
do.		Cloudy—clear.
do.	0.23	Lightly cloudy.
do.	0.04	Lightly cloudy—thunder showers.
do.		Cloudy—showers.
do.		Clear day.
do.		Clear day.
do.		Cloudy—clear.
do.		Cloudy—lightly cloudy.
do.		Cloudy—flying clouds.
do.	0.78	Rainy day.
do.		Drizzle—flying clouds—rain in n't.
do.	0.68	Clear day.
do.		Clear day.

	Thermometer.	Barometer.
Maximum height during the month,	86. on 14th.	30.10 on 22d & 23d.
Minimum do.	54. on 1st.	29.60 on 1st
Mean do.	72.46	29.84